INFORMED DECISION-MAKING IN AMYOTROPHIC LATERAL SCLEROSIS

Supporting the Patient's journey

UMC Utrecht Brain Center

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Informed Decision-Making in Amyotrophic Lateral Sclerosis

Supporting the Patient's Journey

Goed geïnformeerde besluitvorming in amyotrofische laterale sclerose:

Voor een persoonsgerichte zorg

(met een samenvatting in het Nederlands)

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Contents

CHAPTER

1

General introduction

Amyotrophic lateral sclerosis

Amyotrophic lateral sclerosis (ALS) is a devastating, fatal neurodegenerative disease with a high variability of both symptoms and (the associated) life expectancy. ALS affects both upper and lower motor neurons leading to a progressive loss of control over all voluntary muscles involved in movement, swallowing, speech and respiration, and eventually death, usually from respiratory failure (1,2). Average life expectancy is 3-4 years after disease onset, but is highly variable ranging from months to over 10 years (1,3). ALS is a systems disease; besides loss of motor function, up to half of patients develop cognitive and behavioral impairment, and around one in eight, frontotemporal dementia (FTD) (1,4,5). What causes ALS is not yet known, nor is the exact underlying pathophysiology, but clearly, both genetic and environmental factors are involved (1).

ALS is the most common motor neuron disease (MND), now often described as a multi-domain disease. MND also includes primary lateral sclerosis (PLS), which only affects upper motor neurons, and progressive muscular atrophy (PMA), which only affects lower motor neurons (2,6). Life expectancy in PLS and PMA is more positive than in ALS, but cognitive dysfunction in PMA occurs at the same rate as in ALS (7). MND is relatively rare with an estimated incidence in the Netherlands of 2.64 per 100,000 people and a lifetime risk of 1 in 323.

Despite considerable effort over the past decades, there are only a few disease-modifying therapies for ALS, most notably riluzole which prolongs survival by two to three months (1,8). The focus of ALS care is, therefore, to maximize physical functioning and symptom management aimed at supporting control, participation, and quality of life (QoL) (9). ALS care includes treatment of common symptoms like cramps, spasticity, pain, emotional lability and fatigue, but also cognitive deficits, depression or anxiety, as well as support for family and loved ones. Measures to help compensate for function loss include mobility aids, communication aids (i.e. when speech becomes difficult or impossible), non-invasive ventilation (NIV; when there are indications of respiratory failure), and gastrostomy (to reduce the risk of weight loss, malnutrition, or aspiration, choking, and recurring chest infections due to dysphagia).

In the Netherlands, ALS is diagnosed by a neurologist and, for most people, confirmed at the ALS Centre Netherlands in UMC Utrecht, a tertiary referral centre of expertise for patients with motor neuron diseases (ALS, PMA, and PLS). After diagnosis, people are referred to one of 35 certified, multidisciplinary ALS care teams. Multidisciplinary care is recommended due to the many complex needs and the heterogeneous disease course in ALS and has been shown to improve survival, QoL, and satisfaction with care (10–12). These care teams are headed by a rehabilitation physician and include a physical therapist, occupational therapist, speech therapist, dietician, social worker, psychologist, and spiritual counsellor. To guarantee high quality of care for all people with ALS in the Netherlands, they form part of the ALS Care Network created in collaboration with the Dutch Patient Associations for ALS (*ALS Patients Connected* and *Spierziekten Nederland*) and Netherlands Society of Rehabilitation Medicine (*Nederlandse Vereniging van Revalidatieartsen*). The ALS Centre Netherlands supports them through sharing best practice, guideline development and implementation, continuous learning and patient education about the disease, treatment options and clinical trials. Specialized ALS care is often, at some point of the disease, supplemented by professional care at home to support day-to-day life. Near the end-of-life, the general practitioner and a regional palliative care team often adopt a larger role (13).

Journey with ALS

Receiving the diagnosis ALS is uniformly devastating both for the person and their loved ones, although the diagnosis can be a relief after months of uncertainty and a confirmation of their worst fears (15–17). Their future is cruelly taken from them and replaced with the prospect of unrelenting, progressive loss of function and only a few years left to live. During their journey with ALS, everything we take for granted, like getting up from our chair and going for a walk, eating and drinking, hugging loved ones, and even the simple act of speaking and breathing will become a Herculean task as

> *You've known it for a long time. It's been getting worse and worse. But you hope they're wrong and that the muscle specialist will come up with another explanation. Deep down you know it, but it's still devastating news.*
>
> **Person diagnosed with ALS** (14)

their body fades away into stillness. They are forced to cope continuously with 'ongoing change and adaptation' (18) and are faced with a gradual loss of control that may threaten their identity and personhood (19,20). Nevertheless, people with ALS, supported by their caregivers and loved ones, often refuse to see themselves as a burden and show a remarkable resilience and desire to make the best of what remains of their life and their journey with ALS (19,20).

ALS has been described as a family illness because it also heavily impacts the lives of family and loved ones (21). Most people with ALS live at home and informal caregivers, especially partners, children, and other family, take on most care tasks (22). Emotional support and care by family and loved ones is indispensable and makes the journey with ALS more bearable. People with ALS value the support of their family and often engage in decision-making about their care (23). However, as the disease progresses, caregiver burden increases as does the physical and mental toll on the caregiver (24). Concerns over caregivers' burden of care, feeling a burden, family preferences (e.g. to accept interventions in order to prolong life), and other family dynamics can influence decisions of people with ALS to accept, decline, or postpone interventions like gastrostomy, NIV, and invasive ventilation (23).

Shared decision-making

The unrelenting and progressive nature of ALS, and variability of and uncertainty over the course and speed of disease progression necessitate many complex, time-sensitive decisions. Proactive symptom management allows healthcare professionals (HCPs) to support people with ALS and their loved ones in timely decision-making, helping them stay one step ahead of their disease (25). However, insufficient clinical evidence can make it difficult to determine optimal timing to start interventions, and clinical benefits of interventions are not always clear (e.g. gastrostomy). Besides clinical considerations, values and preferences of people with ALS often play an important role in the many difficult decisions they face. Holistic care, tailored to individual disease course and the values, needs and preferences of people with ALS, is provided by patient-centered care which the Institute of Medicine defines as "providing care that is respectful of, and

responsive to, individual patient preferences, needs and values and ensuring that patient values guide all clinical decisions" (26).

Shared decision-making (SDM) is considered the pinnacle of patient-centered care (27). The process of SDM is divided into four steps (28) and starts when a HCP informs the patient that a decision has to be made. Second, the HCP explains the options and pros and cons of each relevant option. Third, the HCP and patient discuss patient's values and preferences and HCP supports the patient in deliberation. Fourth, HCP and patient discuss patient's decisional role preference (i.e. who makes the decision), to make or defer the decision, and discuss possible follow-up. Healthcare outcomes improve when HCPs tailor care to the needs and circumstances of patients (29). Systematic reviews have shown that SDM has a positive effect on patients' health outcomes and satisfaction with decisions (30,31). However, these reviews did not include studies in ALS/MND or other progressive, neurological conditions. There is little research on the benefits or specific challenges of patient-centered care and SDM in ALS (32) or on the impact of individual factors such as prognosis and personality (33). Too often, research – and as a result information – on interventions and treatments focuses on clinical indicators and possible benefits and does not take sufficient account of the complexity and value-laden process of decision-making (34,35).

To support holistic, patient-centered care for people with ALS, more information is needed on the complexity of decision-making in ALS from the viewpoint of all primary stakeholders: people with ALS, their caregivers, family and loved ones, and their HCPs. This will help HCPs better tailor information to individual needs and allow them to better support people with ALS, their caregivers and loved ones to make informed decisions on their journey with ALS.

Aim and outline of this thesis

The general objective of this thesis is to investigate *informed decision-making from the perspective of people with ALS, and their caregivers and HCPs, to better support them during the course of their disease.* In order to achieve this objective we follow the patient's journey in three parts, each of which has its own aim:

Part 1. Starting the journey To support people with ALS and their caregivers who desire a more personalized prognosis of survival.

- In **chapter 2** we develop a communication guide to support physicians in tailoring discussion of personalized prognosis to individual needs of people with ALS and their caregivers.
- In **chapter 3** we explore the experiences of people with ALS, caregivers, and physicians with discussing personalized prognosis.

Part 2. Living with ALS To investigate ALS care decision-making during the course of the disease from the perspective of major stakeholders (i.e. people with ALS, caregivers, and HCP's).

- In **chapter 4** we investigate the feasibility and user experiences of people with ALS, caregivers, and HCP's with telehealth and remote monitoring through "ALS home-monitoring and coaching".
- In **chapter 5** we investigate current practices and barriers in reaching a gastrostomy indication, among ALS care teams in the Netherlands.
- In **chapter 6** we explore the experiences of people with ALS, caregivers, and HCP's in decision-making about gastrostomy.

Part 3. Deciding on end-of-life To investigate end-of-life (EOL) decision-making in ALS.

- In **chapter 7** we investigate the frequencies of EOL practices and associated factors in a 2014-2016 population-based cohort of people with ALS.
- In a **chapter 8** we describe the decision-making process and advance care planning of end-of-life preferences in an individual case of ALS.

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PART

Starting the journey

CHAPTER

2

Discussing Personalized Prognosis in Amyotrophic Lateral Sclerosis: Development of a Communication Guide

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Abstract

Background *Personalized ENCALS survival prediction model* reliably estimates the personalized prognosis of patients with amyotrophic lateral sclerosis. Concerns were raised on discussing personalized prognosis without causing anxiety and destroying hope. Tailoring communication to patient readiness and patient needs mediates the impact of prognostic disclosure. We developed a communication guide to support physicians in discussing personalized prognosis tailored to individual needs and preferences of people with ALS and their families.

Methods A multidisciplinary working group of neurologists, rehabilitation physicians, and healthcare researchers A) identified relevant topics for guidance, B) conducted a systematic review on needs of patients regarding prognostic discussion in life-limiting disease, C) drafted recommendations based on evidence and expert opinion, and refined and finalized these recommendations in consensus rounds, based on feedback of an expert advisory panel (patients, family member, ethicist and spiritual counsellor).

Results A) Topics identified for guidance were 1) filling in the *ENCALS survival model*, and interpreting outcomes and uncertainty, and 2) tailoring discussion to individual needs and preferences of patients (information needs, role and needs of family, severe cognitive impairment or frontotemporal dementia, and non-western patients). B) 17 studies were included in the systematic review. C) Consensus procedures on drafted recommendations focused on selection of outcomes, uncertainty about estimated survival, culturally sensitive communication, and lack of decisional capacity.

Recommendations for discussing the prognosis include the following: discuss prognosis based on the prognostic groups and their median survival, or, if more precise information is desired, on the interquartile range of the survival probability. Investigate needs and preferences of the patients and their families for prognostic disclosure, regardless of cultural background. If the patient does not want to know their prognosis, with patient permission discuss the prognosis with their family. If the patient is judged to lack decisional capacity, ask the family if they want to discuss the prognosis. Tailor prognostic disclosure step by step, discuss it in terms of time range, and emphasize uncertainty of individual survival time.

Conclusion This communication guide supports physicians in tailoring discussion of personalized prognosis to the individual needs and preferences of people with ALS and their families.

Background

Amyotrophic lateral sclerosis (ALS), also known as motor neurone disease (MND), is a neurodegenerative, incurable disease with a very heterogenous clinical presentation.(1) Life expectancy is highly variable ranging from months to over 10 years from disease onset.(2). When diagnosed with ALS, people often desire information about their prognosis.(3) Important aspects of prognosis are symptom progression (i.e. "how well") or how their disease will affect amongst others their mobility and hand function, cognition and behaviour, and psychological symptoms, but also life expectancy (i.e. "how long").(4) Currently, major symptoms are discussed and patients are usually informed that the average life expectancy ranges from 3 to 5 years from disease onset. However, this covers only around 40% of people with ALS (5) and such information can result in dissatisfaction when survival falls outside this range.(6) The *Personalized European Network for the Cure of ALS (ENCALS) survival prediction model for ALS* allows a reliable estimate of survival at diagnosis (i.e. personalized prognosis); the majority of people with ALS (66%) would prefer a more personalized estimate of their life expectancy.(5) However, concerns have been raised about how to discuss the personalized prognosis in ALS appropriately and effectively without causing anxiety or destroying hope while meeting patients' needs.(7)

Communication of prognosis in a terminal disease is difficult and challenging for physicians. Unless the patient broaches the topic, physicians often do not discuss life expectancy because of physician stress, lack of training, and fear of distressing the patient and taking away hope.(4, 8) However, evidence suggests that patients can engage in prognostic discussion with minimal stress (9, 10) and are able to maintain hope by redefining what they hope for.(11, 12) Moreover, prognostic discussion may be beneficial to the patient-physician relationship (13) and patient satisfaction regarding communication;(10, 14) it may empower patients' decision-making (12, 15, 16) and planning for the future,(15, 17, 18) and provide a sense of control.(17, 19) Avoiding the topic can have a negative impact on hope (20) and increase anxiety over time.(21) However, not all patients want to know their prognosis; the impact of prognostic discussion is mediated by patient readiness, i.e. *if* and *when* they want to know, and patient needs.(11, 12, 15, 17, 19)

Breaking the news of a diagnosis of ALS is already stressful for many physicians, even experienced ones,(22, 23) something which is only compounded by the idea of also discussing personalized prognosis.(7) Prognostic disclosure, let alone that of personalized prognosis, is an underdeveloped area and important research priority in adult palliative care.(4, 24) Existing ALS guidelines offer guidance on easing the burden of the disease through symptom management, but very little support on discussing the individual life expectancy.(25–27) The aim of this study was, therefore, to develop a communication

guide to support neurologists and rehabilitation physicians in discussing personalized prognosis, tailored to the individual needs and preferences of people with ALS and their families.

Methods

A multidisciplinary working group of neurologists (MvE, HW), rehabilitation physicians (WK, EK), and healthcare researchers (RvE, AB) was formed to develop a communication guide containing recommendations on 1) using and interpreting the *ENCALS survival model* and 2) tailoring prognostic discussion to the individual needs and preferences of people with ALS and their families.

A) Inventory of topics – The working group inventoried relevant topics on which guidance was needed based on reviewers' comments on the article presenting the *ENCALS survival model* (5), feedback provided by rehabilitation physicians on presentations of the prediction model at the Dutch ALS conferences for healthcare professionals (2017, 2018), and discussions within the working group on timing, interpretation, and discussion of personalized prognosis. Furthermore, the working group selected topics for systematic review.

B) Evidence on patient needs for discussing prognosis in life-limiting disease– We conducted a systematic review to determine patient needs for prognostic discussion in life-limiting disease in line with the Evidence for Policy and Practice Information (EPPI) method.(28) Review questions were formulated based on identified topics (Additional file 1. Review questions). A systematic search was conducted in MEDLINE/PubMed (up to May 2019) to find evidence (Additional file 2. Medline/PubMed search). The search was limited to original studies, systematic reviews, and patient-clinician communication guidelines. Additionally, we conducted an extended search of the references of included original studies, patient-clinician communication guidelines,(29, 30) and systematic reviews on related subjects,(8, 31–34) and a forward search using Google Scholar for articles citing included original studies. Inclusion criteria for the original studies were: full text original studies (in English) that included adult patients with a life-limiting disease receiving palliative care; investigated in-person communication between physician and patient about the life expectancy; focused on the needs of patients and their families; conducted in Europe or a western country. Findings of the studies were extracted and themes were identified based on these findings.

C) Drafting the communication guide and recommendations– In the absence of evidence on discussing life expectancy in ALS, the process of formulating recommendations was based on evidence from other life-limiting diseases and expert opinion of the multidisciplinary working group. First, a subgroup (RvE, AB, WK) of the working group reviewed and discussed the evidence and drafted the initial communication guide and

recommendations. Second, the guide and recommendations were discussed with the working group and finalized over two consensus meetings and one feedback round via email. In formulating the recommendations, generic communication skills such as listening, showing empathy, and checking for patient understanding were considered basic skills by the working group and, therefore, not included. Third, the guide was finalized over multiple rounds of consensus procedures together with an expert advisory panel. Because of the difficult and delicate nature of discussing life expectancy, the working group reflected on additional expertise needed and invited relevant experts to participate. Two patients with ALS and a family member (daughter) were invited as patients and caregivers representatives. An ethicist was consulted to support in tailoring discussion of life expectancy in a manner that is respectful of the needs of individual patients and their families. A spiritual counsellor with an Islamic background was invited to ensure that recommendations match the needs of patients with a different cultural background; in the Netherlands, spiritual counsellors provide support and reflect on beliefs and values of patients and their family regardless of their faith or belief system. An independent rehabilitation physician not connected to the ALS Center Netherlands was invited to review the communication guide from the perspective of rehabilitation physicians who coordinate the multidisciplinary care for patients after the diagnosis. The expert advisory panel reviewed the guide and provided feedback via email; their feedback was discussed by the working group via email and used to further refine the guide. This process was repeated until the expert panel reached consensus.

Results

A) Topics for guidance – Identified topics were divided over two categories. 1) Using and interpreting the *ENCALS survival model*: a) filling in the model and dealing with missing, incorrect or unclear values; b) selecting and interpreting the outcomes; c) communicating the results to the patient; d) uncertainty in estimates of survival; e) timing of prognostic discussion. 2) Individual needs and preferences of people with ALS and their families: a) information needs patient; b) role and needs family; c) patients with severe cognitive impairment and frontotemporal dementia (FTD); d) immigrant patients with a non-western background in the Netherlands.

B) Evidence on patient needs for discussing prognosis in life-limiting disease – A total of 17 studies were included in the review (Figure 1). Two studies provided evidence on patients with an immigrant background in the Netherlands, 15 studies provided evidence on other patient needs. An additional file contains study characteristics, study findings, synthesis of findings, and references of included studies (Additional files 3-6). 15 of the 17 studies focused exclusively on patients with advanced, incurable cancer; none of the studies included patients with a neurodegenerative disease.

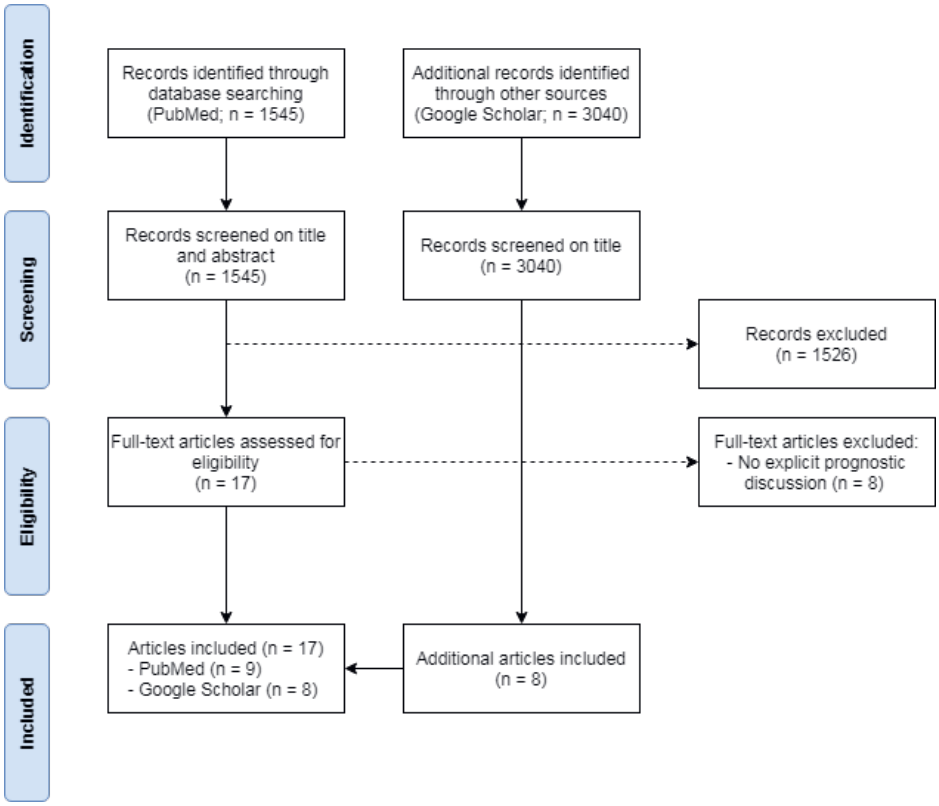

Figure 1. Prisma flow chart of inclusion studies

Based on a synthesis of the evidence, the following themes were identified: tailored information, family support, diverging information needs, and conspiracy of silence. No evidence was found on tailoring discussion to patients with severe cognitive impairments or FTD.

i. *Information needs patient*. Tailored information. Not all patients want to know their prognosis.(18, 19, 35–37) Information needs differ from patient to patient and prognostic disclosure should be tailored to individual needs.(15–20, 35–37) Asking how much patients want to know, without explaining what information is available and exploring their emotions and concerns, might not be sufficient to elicit their need for information.(15, 19, 37) Some patients want more explicit prognostic information and time frames, whereas others desire a more general indication.(17, 19, 35–37) Some expressed the hope of being on the tail of the (survival) curve,(11, 35) whereas others did not want to hear statistics and time frames fearing that these could potentially cause them distress and threaten their hope.(15, 18) Although patients emphasized that false hope should not be encouraged and uncertainty should be underlined, some patients emphasized the

need for physicians to provide hope by indicating positive aspects and good news stories about other patients beating the odds.(11, 17, 21, 35) Furthermore, patients emphasized that physicians should explain that statistics are group estimates which may not apply to the individual.(8, 18)

ii. *Role and needs family*. Family support. Most patients want to have family members present to provide emotional support during prognostic discussion, but patients said this should be the patient's choice.(16, 17, 36, 38) Diverging information needs. The families' needs for information can diverge from those of the patient.(16, 19, 35, 37, 38) Even if a patient does not want to know their prognosis, it is possible that their family does want this information which can help them plan for the future and care requirements.(15, 16, 38) In this case, according to patients, the prognosis can be discussed with their family if they want to know and provided the patient has given permission.(19, 37, 38) Although patients and their families might wish to protect each other from bad news, families respected the patients' right and wish to know.(16, 18)

iii. *Non-western patients with an immigrant background in the Netherlands*. Conspiracy of silence. Families of immigrant patients in the Netherlands, specifically Muslim patients, may prefer to function as an intermediate in prognostic discussion.(39–41) This can result in them maintaining a conspiracy of silence in order to protect the patients' hope and because of different values and beliefs related to health and dying.(39–41) This can create tensions between the values of Dutch healthcare providers desiring open discussion with the patient.(39) However, this difference in values and the topic of life expectancy can be discussed if done in a culturally sensitive manner.(39–41)

C) Communication guide and consensus procedures – Our recommendations in the communication guide have been divided into three parts (Figure 1). The first part deals with practical aspects of filling in and interpreting the prediction model, how to deal with missing or incomplete data, uncertainties of the model and estimated survival, how to interpret the results, and which outcomes of the *ENCALS survival model* to discuss. The second part covers tailoring prognostic discussion to the needs and preferences of individual patients and their families. The third part contains tips on how to provide information on individual life expectancy in stepwise fashion tailored to patient preference, starting with the situation in general (i.e. prognostic groups), and then, if preferred, addressing more specific points (i.e. interquartile range (IQR) of the survival probability).

During the consensus procedures the following topics were discussed between the working group and expert panel. First, selection of outcomes of the *ENCALS survival model* (i.e. prognostic groups, survival curve, survival probability) to discuss and illustrate the estimated life expectancy. Initially, we only considered the prognostic groups and their

median ranges to be suitable for this purpose. We assumed that survival curves and survival probability might overwhelm a patient. However, after exploratory discussions of prognosis by members of the working group (MvE, HW, EK), we concluded the IQR of the survival probability to be suitable for illustrating a more individualized estimation. Second, uncertainty in estimates of survival. We recommended that uncertainty of individual disease progress be emphasized by discussing life expectancy as a group range while also pointing out that some patients within this group are better off and others worse off. This can be further illustrated using the interquartile range of the survival probability. Third, timing of prognostic discussion. The working group deliberated whether personalized prognosis could be discussed during diagnosis given the limited time available to fill in the prediction model during consultation, and whether patients would be able to process the information considering the emotional impact of the diagnosis. Due to a lack of evidence, we decided not to make a recommendation on the preferred timing. However, we concluded it would be unethical to continue telling them the average life expectancy without mentioning the possibility of a more personalized prognosis; the option to discuss personalized prognosis, if the patient wants to know, should be offered during diagnosis. Fourth, recommendation on culturally sensitive communication. The working group concluded that offering spiritual assistance while discussing the prognosis is part of core patient-centered communication skills and recommendations on this were not included. We did include recommendations on how to discuss personalized prognosis in a culturally sensitive manner. Fifth, lack of disease insight versus lack of decisional capacity in cognitively impaired patients. The ethicist in our expert panel suggested we should make a more clear distinction between these, since the latter comes with certain patient rights and physician responsibilities. To avoid ambiguity, the working group decided to focus our recommendations specifically on patients lacking decisional capacity to decide whether they want to discuss their life expectancy. An additional recommendation was to use a cognitive screener like the Edinburgh Cognitive and Behavioral ALS Screen (ECAS) to gain insight into affected domains if a lack of decisional capacity is suspected. Finally, the working group discussed whether percentages (50% of patients) or frequencies (2 out 4 patients) should be used to discuss the IQR. We concluded that patients are more likely to understand survival if expressed as a frequency.

In addition to the consensus procedures, a preliminary version of the guide was discussed with rehabilitation physicians working in ALS care during a workshop at the Dutch ALS conference for health professionals (2019). Their comments on filling in the prediction model (including 'conversion' of progressive muscular atrophy (PMA) or primary lateral sclerosis(PLS) to ALS, patient’s country of origin, forced vital capacity upright or supine, and using the model to track disease progression) were incorporated in the text.

Discussion

We have developed a communication guide to support physicians in discussing personalized prognosis in ALS. Recommendations aim to provide guidance in filling in and interpreting the *ENCALS survival model* and support physicians in tailoring discussion of personalized prognosis to the individual preferences and needs of people with ALS and their families. Uncertainty in estimation of life expectancy, due to heterogenous individual disease progression as well as inherent limitations of the underlying prediction model, are discussed.(5) Finally, patient choice and the right not to know are emphasized as the basis for prognostic discussion.

Communication of personalized prognosis

Our communication guide focuses on discussing estimated life expectancy based on the *ENCALS survival model*. Discussion of life expectancy (i.e. quantity) can support the quality of life of patients by aiding patients and their families in decision-making (12, 15, 16) and planning for their care and future (15, 17, 18), as well as providing patients a sense of control.(17, 19) It can also support healthcare professionals in the timing of appropriate and effective care easing the burden of the disease.(25) However, how to provide numerical estimates of survival and associated uncertainties in a manner that supports patient decision-making is a subject of debate.(42, 43) Being too specific can cause distress if survival is underestimated or overestimated,(6) but too wide a range can reduce credibility and accurate understanding.(44) It has, therefore, been argued in oncology and neurology that life expectancy can be discussed effectively using multiple scenarios based on the median and interquartile range to illustrate average survival, and groups worse and better off.(4, 45) This can also help patients prepare for the worst while hoping for the best; a study in cancer patients showed that patients preferred this to simply median survival.(46) Another possible barrier to patient understanding is statistical illiteracy.(47) Visual aids can help facilitate patient understanding,(48) but patients generally prefer words and numbers to graphs and diagrams.(49, 50) Whether estimated survival is communicated visually or in words and numbers, patient understanding can be supported using frequencies instead of single events, absolute rather than relative risk, mortality not survival, and natural frequencies rather than conditional probabilities (47, 51) as we have done in our recommendations.

Non-western patients with an immigrant background

Studies amongst general practitioners and oncologists show that physicians often communicate differently with non-western patients with an immigrant background: consultations are shorter and less focused on involvement and empathy,(52) patients are involved less in decision-making,(53) and more medical jargon is used.(54) However, it is

Figure 2 Overview of recommendations for discussing personalized prognosis with people with ALS and their families

1. Interpreting the ENCALS survival model

The ENCALS survival model provides three outcomes: 1) survival curve; 2) risk group (i.e. very short, short, intermediate, long , or very long); 3) survival probability and interquartile range.

1. Do not use the survival curve to discuss personalized prognosis, this may overwhelm the patient.
2. Discuss the personalized prognosis based on the risk group, the group median, or the interquartile range of the survival probability (see 3.1 below).

2. Tailoring discussion to individual patient needs

2.1 General

1. Tailor discussion of personalized prognosis to patient readiness and individual information needs.
2. The patient has a right not to know their prognosis.

2.2 Family and next of kin

1. Stimulate patients to bring family or next of kin with them for support.
2. If the patient requests it, discuss their prognosis first with their family or next of kin.

2.3 Diverging information needs

1. If the patient does not want to know their prognosis, but their family or next of kin does, only discuss prognosis with family or next of kin after obtaining the patient's permission.

2.4 Non-western patients with an immigrant background in the Netherlands

1. If there is a language barrier, use a professional translator.
2. Similar to all patients, explore the needs and preferences of patients with a different cultural background, and their families or next of kin, with regard to discussing their prognosis.
3. Family or next of kin of non-western patients might try to shield the patient from their prognosis. If the patient requests it, discuss their prognosis with their family or next of kin.

2.5 Patients with serious cognitive impairments/FTD

1. If due to cognitive impairment/FTD the patient is suspected of lacking decisional capacity to decide whether they want to discuss their prognosis, a cognitive screener like the Edinburgh Cognitive and Behavioral ALS Screen can be used to gain insight into affected cognitive domains.
2. If the patient is judged to lack decisional capacity to decide whether they want to discuss their prognosis, ask their family or next of kin if they want information about the prognosis.

3. Discussing personalized prognosis

3.1 General

1. Ask the patient how much they would like to know and tailor discussion to their preferences.
2. Differentiate between three steps of increasing detail
    i. **Risk groups** without a time indication: very short, short, intermediate, long, or very long.
    ii. **Group average** as a time indication: very short (1.5 years), short (2 years), intermediate (3 years), long (3.5 years), or very long (7.5 years).
    iii. **Interquartile range** of the survival probability if the patient requests a more individual estimation of their prognosis.
3. Emphasize that the prognosis is not an exact time frame, but an estimation and that individual disease progression varies per patient. Point out the long tail (on the graph) and explain that half of the patients live longer, some of whom much longer.

3.2 Example prognostic discussion

1. **Risk group:**
   "Looking at your disease characteristics, you fall into the group with a (much shorter than average / shorter than average / intermediate / longer than average / much longer than average) life expectancy."
   "Half of the patients in every group live longer than the average, some of whom much longer."
2. **Group average:**
   "In this group, half of the people die within the first (1.5 years (much shorter) / 2 years (shorter) / 3 years (average) / 3.5 years (long) / 7.5 years (much longer)) of their disease."
   "The other half live longer, some of whom much longer."
3. **Interquartile range**:
   "Of the patients with your disease characteristics, two out of four die between … months (75th percentile) and … months (25th percentile)."
   "However, one in four patients dies earlier, but one in four lives longer, some of whom much longer."

not at all evident that patient needs for prognostic discussion differ between western and non-western patients. Some, but not all, want to know their life expectancy,(18) desire the topic to be discussed first or only with their family,(18, 39, 41) and prefer a more indirect style of communication.(39, 41) Thus, many core skills of patient-centered communication are relevant during intercultural communication.(55) However, one important difference is the role of family. Families of western patients emphasize the importance of respecting the patient's choice in knowing their prognosis, even though sometimes they would prefer to protect the patient from bad news.(16, 18) Whereas families of non-western patients often prefer to shield the patient from bad news, in order to protect their hope.(18, 39,

41) However, western healthcare values and laws respect patients' autonomy, including the choice of not wanting to know or letting family make this decision.

Impact of cognitive impairments in discussing prognosis

Cognitive or behavioral changes occur in up to half the patients with ALS,(1) which can impact patient autonomy in, amongst others, decision-making and communication of personalized prognosis. Around 13% of patients with ALS fulfill the criteria for the behavioral variant of FTD,(1, 56) which can cause apathy, reduce insight, and impair decision-making.(57) However, this does not necessarily mean the patient lacks decisional capacity. Therefore, the working group decided to differentiate between cognitive impairment versus a lack of decisional capacity regarding decision-making on discussion of life, and focus our recommendations on the latter. If a lack of decisional capacity is suspected, a cognitive screener can be used to provide insight into affected cognitive domains. A concise screener like the ALS-CBS could be used to screen for behavioral changes; however, a broader screener like the ECAS is recommended because difficulties in decision-making can also be caused by other domains like impaired language or memory.(58) Assessing decisional capacity depends on the physician's judgement and weighing of multiple relevant factors in addition to cognition (e.g. emotion, motivation, and volition), is specific to the situation, and subject to different legal definitions depending on the country.(57) Discussing estimated survival with the patient's family, if they want to know, can still be important as they will have to take into account a poorer prognosis due to cognitive impairment.(5, 59)

Generalizability

When using the *ENCALS survival model,* two limitations have to be taken into consideration. First, although it is becoming more common to consider ALS, PMA, and PLS to be on a spectrum within the same disease,(1) the model has only been validated in patients with ALS.(5) Second, the model has been developed and calibrated with data from 14 ALS centers across 9 countries (5) and can be used to reliably estimate prognosis for these countries using their cohort. Other western countries can use the general ENCALS survival model which can be tailored to regional factors by recalibration of the intercept of the prediction model in future studies. However, the model has not been calibrated for countries in Asia, South-America or Africa, and differences in genetics, healthcare systems, and other factors have thus not been taken into account. An additional consideration is that this guide was developed in the Dutch healthcare setting. However, we believe that our recommendations can be useful to support discussion of personalized prognosis in other western countries. Evidence underlying recommendations, except those on immigrant patients in the Netherlands, comes from

international studies and are in line with international guidelines on communication in cancer.(29, 30)

Specificity

While conducting our review, we found no evidence on discussing life expectancy in ALS. Available evidence was mainly based on patients and family caregivers in terminal cancer. It is unclear whether these findings can be generalized to ALS. Whereas in most cancers people are able to retain some hope of being cured, the disease outcome in ALS is homogenous in its invariable lethality and relentless, unavoidable and constant prospect of decline and loss.(60) Possibly as a result, patients with ALS more often engage in advance care planning compared to those with cancer,(61) which can necessitate more information on personalized prognosis. On the other hand, cognitive impairment plays a much more significant role in ALS, even early in disease,(62) which can hinder decision-making and impact decisional capacity,(57) a topic absent from patient-clinician communication guidelines in cancer.(29, 30)

Strengths

This is the first communication guide, as far as we are aware, on tailoring discussion of personalized prognosis in life-limiting disease based on a prediction model. Additional strengths of this project are inventory of topics amongst the target audience, development over multiple rounds of consensus procedures, and feedback by a broad expert panel which included people with ALS and a family member.

Limitations

One limitation of our guide is that the underlying evidence was obtained from studies in patients with terminal cancer and this may not be valid for patients with ALS. A second limitation concerns our search to identify the needs of immigrant patients with a non-western background in the Netherlands. We only found evidence on the needs of Muslim patients with a predominantly Turkish or Moroccan background,(41, 63) the two largest immigrant groups in the Netherlands.(64) However, in formulating our recommendations, the working group and expert panel did take into account all immigrant groups in the Netherlands and our recommendations are in line with Dutch consensus recommendations on palliative care for people with an immigrant background.(65)

Implementation

The *ENCALS survival model* is accessible to physicians and researchers by registering online.(66) This communication guide is intended to facilitate discussion of personalized prognosis in ALS and will be distributed through the network of the ALS Center Netherlands. In addition, the full Dutch version and an abbreviated English version will be made available online at our website.(67) However, the development of this

communication guide is only the first step in the implementation of discussion of personalized prognosis. We are currently conducting a qualitative study to evaluate patient and caregiver experiences with discussing personalized prognosis based on our communication guide. The results of this study will be used to provide recommendations on discussing life expectancy in ALS and the guide will be adapted accordingly.

Conclusion

This communication guide supports physicians in filling in and interpreting the *ENCALS survival model* while tailoring discussion of personalized prognosis to the individual needs and preferences of people with ALS and their families. Uncertainty of estimated survival and individual disease progression should be emphasized by discussing the estimated life expectancy as a range and underlining that some patients are better off and some worse off. Prognostic discussion should be tailored to individual information needs and preferred level of explicitness. Patients should be given the choice of having family present for emotional support. Families of patients with a non-western background may try to shield the patient from bad news about their prognosis, but, while respecting cultural values, physicians should explain that this is the patient's choice. When information needs diverge and the patient does not want to know their prognosis, this can be discussed with the family with patient permission. Whether to discuss personalized prognosis or not is always the choice of the patient, including the right not to know. However, if the physician judges that the patient lacks the capacity to make this decision due to severe cognitive impairments or FTD, an exception should be made and life expectancy discussed with their family. An ongoing, qualitative study is currently evaluating the effect of tailored discussion of personalized prognosis on patients with ALS.

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Supplementary information

Supplement 1: Review questions

1. What are patient needs for discussing prognosis in a life-limiting disease?
    a. What are information needs of patients when discussing prognosis?
    b. What is the role and what are information needs of caregivers/family when discussing prognosis?
    c. What are specific needs of patients with serious cognitive impairments or ALS-FTD?
2. What are specific needs of non-Western patients in the Netherlands?

Supplement 2: MEDLINE/PubMed search

Database: MEDLINE (PubMed).

Search (research question 1):

("communication"[MeSH Major Topic] OR "communication"[Title/Abstract] OR "conversation"[Title/Abstract] OR "Physician-Patient Relations"[MeSH Major Topic] OR "Physician-Patient relations"[Title/Abstract] OR "patient physician relationship"[Title/Abstract] OR "physician patient relationship"[Title/Abstract] OR "patient professional relationship"[Title/Abstract] OR "professional patient relationship"[Title/Abstract] OR ("patient"[Title/Abstract] AND ("physician"[Title/Abstract] OR "professional"[Title/Abstract]) AND "relationship"[Title/Abstract])) AND ("attitude to death"[MeSH Major Topic] OR "attitude to death"[Title/Abstract] OR ("attitude"[Title/Abstract] AND "death"[Title/Abstract]) OR "prognosis"[MeSH Major Topic] OR "prognosis"[Title/Abstract] OR "life expectancy"[MeSH Major Topic] OR "life expectancy"[Title/Abstract] OR ("expectancy"[Title/Abstract] AND "life"[Title/Abstract]) OR "truth disclosure"[MeSH Major Topic] OR "truth disclosure"[Title/Abstract] OR ("disclosure"[Title/Abstract] AND "truth"[Title/Abstract]) OR "prognostic disclosure"[Title/Abstract] OR ("prognostic"[Title/Abstract] AND "disclosure"[Title/Abstract])) AND ("terminal care"[MeSH Major Topic] OR "terminal care"[Title/Abstract] OR ("terminal"[Title/Abstract] AND "care"[Title/Abstract]) OR "palliative care"[MeSH Major Topic] OR "palliative care"[Title/Abstract] OR ("palliative"[Title/Abstract] AND "care"[Title/Abstract]) OR "end-of-life"[All Fields])

Total hits PubMed: 1545.

Search date: 03-05-2019.

Inclusion criteria: full text original studies (in English) that included adult patients with a life-limiting disease receiving palliative care; investigated in-person communication

between physician and patient about the life expectancy; focused on the needs of patients and their families; conducted in Europe or a Western country.

Search (research question 2):

("communication"[MeSH Major Topic] OR "communication"[Title/Abstract] OR "conversation"[Title/Abstract] OR "Physician-Patient Relations"[MeSH Major Topic] OR "Physician-Patient relations"[Title/Abstract] OR "patient physician relationship"[Title/Abstract] OR "physician patient relationship"[Title/Abstract] OR "patient professional relationship"[Title/Abstract] OR "professional patient relationship"[Title/Abstract] OR ("patient"[Title/Abstract] AND ("physician"[Title/Abstract] OR "professional"[Title/Abstract]) AND "relationship"[Title/Abstract])) AND ("terminal care"[MeSH Major Topic] OR "terminal care"[Title/Abstract] OR ("terminal"[Title/Abstract] AND "care"[Title/Abstract]) OR "attitude to death"[MeSH Major Topic] OR "attitude to death"[Title/Abstract] OR ("attitude"[Title/Abstract] AND "death"[Title/Abstract]) OR "prognosis"[MeSH Major Topic] OR "prognosis"[Title/Abstract] OR "life expectancy"[MeSH Major Topic] OR "life expectancy"[Title/Abstract] OR ("expectancy"[Title/Abstract] AND "life"[Title/Abstract]) OR "truth disclosure"[MeSH Major Topic] OR "truth disclosure"[Title/Abstract] OR ("disclosure"[Title/Abstract] AND "truth"[Title/Abstract]) OR "prognostic disclosure"[Title/Abstract] OR ("prognostic"[Title/Abstract] AND "disclosure"[Title/Abstract])) AND ("cultural diversity"[MeSH Major Topic] OR "cultural diversity"[Title/Abstract] OR ("cultural"[Title/Abstract] AND "diversity"[Title/Abstract]) OR "Transients and Migrants"[MeSH Major Topic] OR "Transients and Migrants"[Title/Abstract] OR ("Migrants"[Title/Abstract] AND "Transients"[Title/Abstract]) OR "cultural competency"[MeSH Major Topic] OR "cultural competence"[Title/Abstract] OR "cultural competency"[Title/Abstract] OR "culturally competent care"[MeSH Major Topic] OR "culturally competent care"[Title/Abstract] OR ("culturally"[Title/Abstract] AND "competent"[Title/Abstract] AND "care"[Title/Abstract]) OR "Emigrants and Immigrants"[MeSH Major Topic] OR "Minority Groups"[MeSH Major Topic] OR "Islam"[MeSH Major Topic] OR "Islam"[Title/Abstract])

Total hits PubMed: 154.

Search date: 03-05-2019.

Inclusion criteria: full text papers (in English) on original studies that included adult patients with a life-limiting disease receiving palliative care; investigated in-person communication between physician and patient about the life expectancy; focused on the needs of patients and their caregivers; focused on the needs of patients and their caregivers with a non-Western background in the Netherlands.

Supplement 3: Table 1. Study characteristics

Nr.	Study	Study purpose	Design	Methods	Sample /setting
[1]	Butow 2002	To obtain patient and health professional views on optimal ways of presenting prognosis to patients with metastatic cancer.	Qualitative study.	Semi-structured interviews with detailed probes.	*N* = 17; women with metastatic breast cancer. Australia
[2–5]	Clayton 2005 †	To examine the views of terminally ill patients, caregivers, and PC HPs on fostering coping and hope, preferred content of information for discussion of life expectancy and by whom, how, and when the discussion should be conducted.	Qualitative study.	Focus groups and individual interviews with patients unable to attend the focus groups.	*N* = 19; palliative care patients (advanced cancer). Australia.
[6]	Coulou-rides Kogan 2015	To explore seriously ill patients perspective and experience of an IPC consultation, and to explore patient attitudes toward the information derived from the consultation.	Qualitative study	Semi-structured interviews the week after IPC (Initial Palliative Care) consultatio n.	N=11; terminally ill patients in palliative care. USA
[7]	Curtis 2008	To study the interactions between the desire to have hope supported and	Qualitative study.	Semi-structured interviews.	*N* = 55; Patients with advanced cancer (30) and severe COPD

Nr.	Study	Study purpose	Design	Methods	Sample /setting
		need to receive explicit prognostic information amongst patients, family and HCP.			(24), or both (1). USA
[8–10]	De Graaff 2010-2012 ††	To explore how Dutch professional care providers deal with Turkish and Moroccan immigrants ideas on palliative care, what influences communication and decision-making, and the influence of different styles of care management.	Qualitative study.	Semi-structured interviews.	*N*= 36; Turkish or Moroccan patients with incurable cancer (6) and relatives (30). The Netherlands
[11]	Fried-richsen 2011	To explore the experiences and preferences of terminally ill cancer patients regarding truth telling in the communication of poor prognoses.	Qualitative study.	Semi-structured interviews.	*N* = 45; terminally ill cancer patients in palliative care. Sweden
[12]	Hagerty 2005	To identify preferences for the process of prognostic discussion among patients with incurable metastatic cancer.	Observatio nal study.	Postal survey measuring patient preference s for manner of delivery of prognostic informatio	*N* = 126; patients with metastatic cancer. Australia

Nr.	Study	Study purpose	Design	Methods	Sample /setting
				n, including how doctors might instill hope.	
[13]	Kirk 2004	To elicit views of patients in palliative care and their family members regarding their experiences of information disclosure about the illness.	Qualitative study	Semi structured interviews of participants' perceptions of their experiences of disclosure about the illness.	*N* = 37; patients in palliative cancer care in Australia (*N* = 21) and Canada (*N* = 16).
[14]	Mitch-ison 2012	To explore personal experiences of and preferences for prognostic communication in migrant and Anglo-Australian patients.	Qualitative study	Structured interviews.	*N* = 31; Anglo-Australian patients with metastatic cancer and 25 family members; responses of immigrant groups were not included. Australia
[15]	Ooster-veld-Vlug 2017	To explore how Dutch patients and relatives with and without a Muslim background think that realistic	Qualitative study	Online focus group.	*N* = 9; patients and relatives with a Muslim background.

Nr.	Study	Study purpose	Design	Methods	Sample /setting
		and hopeful information should be combined in physician–patient communication at the end of life.			The Netherlands.
[16]	Rohde 2019	To explore experiences of patients with incurable colorectal cancer while in palliative care and their reflections on the information provided, specifically disease, prognosis and life expectancy.	Qualitative study.	Semi-structured interviews.	*N* = 20; patients with colorectal cancer receiving palliative chemotherapy. Norway
[17]	Walczak 2013	To explore patients perspectives across two cultures (Australia and USA) regarding optimal communication about prognosis and end-of-life care issues.	Qualitative study.	Semi-structured individual interviews and focus group.	*N* = 34; patients with advanced, incurable cancer. Australia (*N* = 15) and USA (*N* = 19)

† The results of this study were split over four separate articles.

†† The results of this study were split over three separate articles.

Supplement 4: Table 2. Study findings

Results	Discussion & Conclusions
[1] Butow 2002	
1. Patient needs *Communication within a caring, trusting, long-term relationship:* Patients express the view that they wanted to hear their prognosis from their oncologist, whom they knew and trusted. *Clear, straight-forward presentation of prognosis where desired:* Most women wanted prognostic information to be disclosed in a straightforward, honest manner, if desired. This method of disclosure was seen to have several positive outcomes, including reassurance, promotion of trust and good coping, effective decision-making and planning, and protection against false expectations. *Encouragement of hope and a sense of control:* Hope was mentioned by all the patients as a vital part of prognostic discussions. They saw this as a distinguishing feature of the "good" doctor. 1a. Information needs *Strategies to ensure patient understanding:* Some women also emphasised the need for doctors to assess whether the patient is capable of comprehending the statistics presented, and more importantly, whether they can interpolate these figures to their own situation. Most patients wanted an honest appraisal of their situation, but were wary of statistics, especially a time frame. They saw statistics as potentially hope-destroying and wanted to hear "good news" stories.	1. Patient needs All interviewees emphasised the importance of conveying hope. All respondents indicated the need for realism and honesty to temper hope-giving, but felt that this could be achieved even within the most hopeless scenario. 1a. Information needs Participants felt that the health professional needed to carefully explore with the patient what information they want, how they will use such information and how such information might most usefully be imparted to them. The end result of such a discussion may be far from the presentation of a survival curve.
[2] Clayton 2005a	

Results	**Discussion & Conclusions**
1. Patient needs All participant groups said that the manner in which the information is given is often more important than what is actually said. 1a. Information needs *General indication, not a time frame:* Many patients and carers said they did not want to be given a time frame, but wanted a general indication of what to expect in the future. *A time frame if requested:* Some patients and carers said that it was important to them to be given a survival time frame. A few patients and carers expressed frustration that they had not been given this information. *Avoid being too exact:* Some patients stressed that it is important not to be too restrictive or definite with time frames, because patients may fixate on this. *Various ways to phrase time frames:* Those patients and carers who wanted to be given a time frame mostly said they would like to know how long the average person with their condition would live and/or be given a rough range. A few said they would like to know the longest possible time that they might live. *Statistics:* Patients and carers also said that it is important to explain that statistics apply to a group so they can only be used as a guide. Patients and carers wanted their HPs to highlight that every person is an individual and that people's experiences are different even with the same disease. 1b. Role and needs family Some carers said their reasons for needing a time frame were different to those of the patient; for	1a. Information needs While most patients said it was very important to be informed that their illness would limit their lifespan, not all wanted to be told detailed information about their life expectancy.

Results	Discussion & Conclusions
example, knowing how much time to take off work and whether to call other family members to share the care-giving burden.	
[3] Clayton 2005b	
1. Patient needs All participants groups believed that there were ways of fostering coping and nurturing hope when discussing prognosis and EOL issues with terminally ill cancer patients and their caregivers. **Emphasize what can be done** *Control of physical symptoms:* Patients said that it is important to reassure patients that pain and other symptoms can be controlled. *Emotional support, care, and dignity*: Patients said that it is vital for the HP to convey the sense that they care about the patient and to show compassion. The value of listening and acknowledging the emotional concerns of the individuals involved also was highlighted. Patients emphasized that patients need to know that their physician and other HPs are doing their utmost to help them, and that they will not be abandoned, they will have plenty of support. *Practical support*: Patients commented that it was reassuring to be informed about equipment and resources that are available. **Balance between truth and hope** Several patients said that it is important to be honest with patients when discussing the future. None of the patients and caregivers indicated that they did not want their HP to be honest. Some participants even said that it gave them hope when the HP was honest. Nevertheless, patients … stated that it is important	1. Patient needs The value of emphasizing what can be done in terms of the control of physical symptoms; emotional support, care, and dignity; and practical support was highlighted by all participant groups. The importance of being honest while at the same time not imposing the truth about a patient's prognosis when it was not wanted was emphasized. Similarly, pointing out the positive aspects while not encouraging the patient's false hopes also was raised by all participant groups.

Results	Discussion & Conclusions
not to be too blunt or provide a great deal of detailed information that the patient does not want to hear. The need to maintain hope was emphasized by all the participant groups. Some patients and caregivers said that it is important for HPs not to give false hope but any positive aspects should be emphasized. **The spectrum of hope** Several patients and some caregivers also spoke about a range of ways to find hope in their situation. The hope of being well cared for and supported by HPs was the source of hope that was mentioned most frequently by patients and caregivers. A few patients spoke of the hope of beating the odds and being on the tail of the survival curve. The inaccuracy and uncertainty of the prediction of life expectancy were seen as potential causes for hope because the person may live longer than average.	
[4] Clayton 2005c	
1. Patient needs **Who and When to Initiate Discussions About Prognosis and EOL issues** *Wait for the patient to raise the topic:* Some patients felt it should be up to patient and/or carer to initiate the discussion. A few patients and carers spoke of the patients' right to be protected and not have painful discussions about prognosis. *Offer all patients the opportunity to discuss the future*: Most patients and carers said they thought it would be alright for the doctor to offer to discuss prognosis provided they had the option of saying they did not want this information. Of note, no patients, carers, or HPs felt that the doctor or nurse should bring up the facts out of the blue without checking first whether	1. Patient needs Provided the patient and/or carer is given the option not to hear the prognosis and discuss EOL issues and the topic is broached in a sensitive manner, most participants felt that it was appropriate and important for the doctor or nurse to make this an accessible topic, because the patient might find it difficult to raise it themselves.

Results	**Discussion & Conclusions**
the patient or carer wanted this information, as it was felt to be important to respect people's right not to know. *Initiate the discussion when the patient seem ready*: Some patients said that HPs should initiate the discussion when they think the patient is ready. **Optimal context** *Relationship with the health professional*: Patients strongly emphasized the importance of being comfortable with their HP when discussing prognosis. They said that it is vital for the HP to show compassion and respect and to ensure that adequate support is present. Some patients spoke of the devastating effect of having bad news broken when the doctor did not show any signs of compassion. *Negotiate who should deliver the information:* Most patients and carers, if they wanted to have the discussion at all, wanted to discuss prognosis and EOL issues with a doctor or nurse. However, one carer said her husband wanted their priest and not the doctor to deliver any bad news and had requested this be documented in the medical record. Another patient requested that the family be told first and for the family, not the doctor, to be the one to tell him. <u>1a. Information needs</u> *Clarify how much the patient wants to know:* All patients said that it is important to tailor the information to the individual patients' preference and be aware that this may change over time. <u>1b. Role and needs family</u> *Negotiate who should be present during the discussion:* Most patients wanted someone from their immediate family present but one patient was angry	<u>1a. Information needs</u> Patients varied in the amount of information that they would want regarding prognosis and EOL issues. Together these findings stress the importance of clarifying with patients how much detail they want to know. <u>1b. Role and needs family</u> There was a wide divergence of needs and wishes expressed by patients regarding whether they would prefer to be on their own or have their partner or family present during discussions about prognosis and EOL issues, suggesting that clarification and negotiation is essential.

Results	Discussion & Conclusions
when her initial diagnosis was disclosed in front of her son, as she felt she should be the one to tell him. Some patients said they valued being able to discuss sensitive topics, such as dying, on their own with a PC HP, because they did not want to worry their family about these issues. In general, participants felt that it was important to negotiate who should be present when bad news was given.	
[5] Clayton 2005d	
<u>1b. Role and needs family</u> Several caregivers stated that patients and caregivers have different needs for information concerning prognosis. The specific informational needs of caregivers were often emphasized. For example, caregivers may want information regarding how much time to take off work and other information to plan for future care of the patient. Patients did not provide specific details concerning what type of information would be useful for them versus their caregivers to know. Some caregivers were concerned that it was unethical to discuss the patient's prognosis without the patient present. Although many patients said they would be happy for the HP to have a separate discussion with family members regarding their condition, most said they would want to give permission first. In addition, some patients believed they could cope with prognostic information better than their family. Conversely, some patients said it was important to have the support of someone in their family with them during these discussions because of the potential distress that they may feel. A few caregivers expressed a need to protect the patient from being given distressing news by HPs and	<u>1b. Role and needs family</u> The current study suggests that terminally ill cancer patients and their caregivers have very different needs for information concerning prognosis and EOL issues. In other cases, although less frequently reported by participants in the current study, the patient may desire more details concerning their prognosis than the caregiver.

Results	Discussion & Conclusions
emphasized the patient's right not to know this information. Some patients believed it would be taking away their rights if a physician discussed information about them, including bad news, with their family but not with them. One patient said he believed it was up to the family to decide what information was given to the patient.	
[6] Coulourides Kogan 2015	
1. Patient needs *Holistic care approach:* The holistic structure of the IPC consults and subsequent related care options was well received by participants. Patients perceived the ability of palliative care to meet the multifaceted physical, emotional, and spiritual health needs of participants as a positive benefit of the holistic care approach. *Knowledge/information gained:* Hearing the information that was presented in the IPC consults and the subsequent knowledge gained from the discussion) motivated some participants to engage in productive and meaningful decision making around their health status, care, and wishes. *Hope and enlightenment:* Patient hope or positive expectations were influenced by the information/knowledge and holistic care received during the IPC consults. Additionally, information received from the IPC consult enabled participants to reframe hope from hope of a cure to hope for pain relief and care consistent with their personal goals such as returning home, controlling pain, and spending time with their family members.	1. Patient needs *Impact of holistic care on hope* Two interconnected themes were very closely related to *hope*: holistic care and knowledge/information gained. Patients described how hearing information on the availability of services, hospital resources, and information on holistic nature of palliative care—such as the possibility of symptom control, psychological and spiritual care—made me feel good, enlightened, and motivated.
[7] Curtis 2008	
1a. Information needs	1a. Information needs

Results	Discussion & Conclusions
Determining "how much information?": Patients and families were directly asked how much information they wanted. In response, they said "all the information." However, in further questioning, a substantial minority of participants made it clear that they did not want explicit information about prognosis such as median survival, estimated life expectancy, or "worst case scenario" and felt that this information could harm them. Throughout the interviews, we found that simply asking patients how much information they want, without exploring their emotions and concerns, did not adequately elicit informational needs. *Direct versus indirect approach:* Some patients favored a more indirect approach: prognostic information was viewed as a threat to hope and they suggested that a more cautious approach to providing prognostic information might be most helpful. Whereas other patients preferred more direct approaches to prognostic information; they did not report that receiving prognostic information compromised their hopes and they suggested that a more direct and straightforward approach to prognosis would be most helpful. They expressed the need for physicians to communicate fully and explicitly what could happen in the future. <u>1b: Role and needs family</u> Some patients differed from their family members in their desire for prognostic information, f.e. with the patient not wanting to know but the partner wanting to know to help prepare the children. Participants who endorsed an indirect approach suggested that physicians should discuss prognosis with the family in situations where they cannot discuss prognosis with the patient. A family member underscored the	The question "how much information" did not provide patients and families with enough of an opportunity to explain their concerns about receiving explicit prognostic information. This study suggests that there is important variability in the way that patients with life-limiting diseases, particularly COPD and cancer, approach the interaction of wanting support for hope and wanting explicit prognostic information from their clinicians. Simply asking patients and family how much information they want seems to be an unrevealing approach to understanding individuals' needs. <u>1b: Role and needs family</u> Patients and families differ in their needs and desires for hope and explicit prognostic information.

Results	Discussion & Conclusions
importance of providing family with information about prognosis, because even if the patient would rather not know, they needed it.	
[8] De Graaff 2010	
1c. Non-Western patients **Keeping hope alive** *Patients and their family:* Patients and their family want care providers not to take away the hope of recovery by talking directly and openly about the negative prognosis. If hope is removed, then the family is afraid that the patient will give up while hope can give him strength to get through this very difficult period. Some respondents also say that they cannot take away the patients hope for religious reasons: it is for Allah to decide when someone is going to die; life and the possibility of recovery are in Allah's hands. This is why families ask care providers to be cautious in giving information to the patient. However, often some of the family are informed. *Different values:* The reaction of doctors to this request of silence from patients' relatives diverged, with some accepting it while others did not want to take the wishes of the family into account because of their different values. The values of Dutch professionals are contradictory to those of the families of patients with a Turkish or Moroccan background. Dutch professionals are focused on fully informing the patient to reach shared decision making and to realize advanced care planning. Whereas those of families with a Turkish or Moroccan background are centered on keeping patients hope alive, and	1c. Non-Western patients **Discussion** We would recommend that care providers place their own perceptions and practices in perspective, and consider the religious and cultural views of their patients and family members. **Conclusion** Taking time and creating opportunities to question mutual expectations wishes and fears can help to avoid frictions and lead to strategies and care interventions acceptable to all parties involved.

Results	Discussion & Conclusions
therefore the family decides how much information can be given to a patient.	
[9] De Graaff 2012a	
1c. Non-Western patients **Multilingual triads** In only seven of the 33 cases had the patient mastered the Dutch language well enough to communicate independently with the care providers. In the other cases, communication on care and treatment needed to be translated. Relatives often did not consider a professional interpreter to be acceptable, as they feared that the information provided to their beloved sick one would be too direct. Communication mostly took the form of a triad between HP, the patient and a close relative who spoke Dutch very well, supported the patient and geared the decision-making process to the patients' own wishes. **Different expectations of communication** As far as relatives were concerned, not all subjects were up for discussion. If a doctor for example talked about the diagnosis of cancer with a member of the family (acting as interpreter), he or she generally refused to convey this to the patient. *Different ideas about the role division in communication:* Communication between care providers and patients of Turkish or Moroccan descent mostly occurred via relatives. Family members acting as interpreters often held a key position in the triad, as they not only translated in the literal sense, but also were able to furnish patient and health care provider with background information.	1c. Non-Western patients **Conclusion** In conclusion, miscommunication around palliative care involves more than different cultural backgrounds and language problems; it may also be caused by the triangular form of communication. Nurses, doctors and other care providers should, therefore, learn how to deal with talking in triads.

Results	Discussion & Conclusions
The family often decided when and to what extent the patient should be involved in the conversation. **Responses of patients and family to conflicting opinions and wishes regarding communication** When the wishes with regard to communication of healthcare providers differed from those of the family of the patient, the reaction of the family differed. Some grew angry at the care provider, but felt that protests would be to no avail, as they would not be heard, anyway. Other relatives acknowledged that expectations about communication could differ. Some accepted that care providers wished to bring up sensitive subjects that the family would rather avoid. They did feel, however, that care providers should convey painful messages gradually. All relatives indicated that what they found most important was that the care providers recognized them as participants in the communication process.	
[10] De Graaff 2012b	
<u>1c. Non-Western patients</u> Experiences of Turkish and Moroccan patients, their relatives and their professional care providers differed considerably with regard to communication and decision-making. Four different variants were identified: no agreement between family and care providers rooted in Dutch are providers denial of the existence of the care management group around the patient; communication problems within the family; lack of satisfactory communication and agreement among the professional care providers; and good communication both within the family and with the care providers satisfying all parties. Identified factors influencing communication were ethnic-cultural differences, language barriers, internal	<u>1c. Non-Western patients</u> The concept of care management group rejects the assumption of a simple one-to-one communication between an autonomous patient and an all-knowing professional and emphasizes the broker role of the patients' social environment. An important feature of the dynamics in these interactions is that they challenge the principle of autonomy, not only for patients, but also for

Results	Discussion & Conclusions
conflicts in families as well as professional teams, professionals who do not accept the family as a care management group, and insufficient acknowledgement of the broker role of the patients social environment by the HCP. Facilitating factors in communication were tailoring the message to the recipient, and delivering bad news in small doses and in phases.	professionals. This study calls for more sensitivity to the care beliefs and demands of ethnic minorities.
[11] Friedrichsen 2011	
<u>1a. Information needs</u> All patients wanted to know the truth, but their definitions of truth varied. *Absolute truth*: Some patients wanted the factual truth that they are dying and would die within a limited time, containing a clear time limit and definite expectations of what the future would hold. *Partial truth*: some wanted partial truths and particular facts, but not all of the information. Patients meant that this truth should be positive information that they could benefit from. But hard facts with too detailed information such as having a limited time to live or possibly intolerable symptoms were not included in preferred half-truths. This helped patients maintain some hope. *Desirable truth*: Some patients made a distinction between the truth that was provided by their physician and what they wanted to hear, their inner desirable truth, the opposite of their situation (i.e. being healthy, cured). This was because they were afraid to discuss this again, not wanting to hear unpleasant information about the future. The preferred type of truth and corresponding coping strategy impacted on their preferences concerning	<u>1a. Information needs</u> This study shows that terminally ill patients want to know the truth but the content or definition of this truth might vary. Although patients say, when directly asked, that they want to be told the truth by their doctor, their preferences change when they receive bad news in real life. Therefore, in clinical practice, it could be helpful to ask patients how much and what kind of information they prefer to know about their illness, because the truth is different to different patients.

Results	Discussion & Conclusions
truth disclosure and physicians' communication of bad news. 1b. Role and needs family Some of the patients that wanted only partial truths decided to leave the knowledge about the "real truth" to family members or friends, as they believed that the "real truth" was too much for them.	
[12] Hagerty 2005	
1. Patient needs *General:* Factor analysis showed that 57% of total variance for preferred *general* doctor behaviors when discussing prognosis was explained by 6 constructs. The two most important constructs of doctor behavior were: 1. Realism and individualized care (providing realistic and direct information tailored to the individual); 22% of total variance. 2. Emotional support (providing information on support services and an openness to discuss patients' fears and concerns); 12% of total variance. 3. Facilitation of coping with dying (displaying openness to discuss concerns about dying and providing information on palliative care services); 7% of total variance. 4. Provision of information (f.e. ensuring patient understanding); 5% of total variance. 5. Emphasizing all options (f.e. discussing optimistic future scenarios); 5% of total variance. 6. Personal (f.e. share some personal information); 5% of total variance. *Hope:* Factor analysis showed that 54% of total variance for *hope*-giving behaviors was explained by three factors: 1. Expert/positive/collaborative doctor style (expertise, humor, and inclusion of patient as part of the team); 28% of total variance. 2. Avoidant [negative effect] (avoiding or appearing uncomfortable, giving the prognosis to others first);	

Results	Discussion & Conclusions
14% of total variance. 3. Empathic (expressing one's own feelings or asking the patient about his or her own reaction to the prognosis); 12% of total variance.	
[13] Kirk 2004	
1. Patient needs **Process** A number of attributes were identified to be important in communicating information: playing it straight [being honest and direct], showing you care [communicating with compassion and empathy], staying the course [communicating that the patient and family will not be abandoned]. **Content** *Prognosis:* Participants were distressed when information about prognosis was perceived as vague or inaccurate, was presented along with conflicting or inconsistent information, or was given by someone not perceived to be an expert or directly in charge of the patient. Evasiveness was often perceived as unhelpful. A subtheme with regard to the prognosis: expert disclosure (the need for prognostic information to be given by the health provider perceived to be an expert). *Hope:* The second most important content area was the provision of hope and the need for hopeful messages at all stages, described as a possibility for cure or longer life or related to short term visions of the future or continued care or an indication that the health professionals are not giving up. Patients expressed a continuing need for hope even when they knew and accepted that they were in the terminal stages of disease and had a limited life expectancy. To	1b Role and needs family Most patients wanted their family member present when they met health carers, although a small number expressed a desire to be the first to know or to control how much or when the family member should be told. Family members respected the patients wish to know or not, although some would have wanted to protect the patient from details regarding prognosis. No family members had requested that the patient was not fully informed.

Results	Discussion & Conclusions
have hope dashed by a rushed or insensitive health carer was experienced extremely negatively. 1a. Information needs A number of attributes were identified to be important in communicating information: making it clear [conveying information in a way that the patient/family can understand], giving time [providing enough time to the patient and family when discussing information], pacing information [giving information at a rate patients and families can assimilate]. A subtheme with regard to the prognosis: specificity of prognostic information the need for honesty and respect for the level of detail wanted by the patient/family. 1b: Role and needs family The needs of patients and families were similar but diverged somewhat as the illness progressed. Many patients reported not wanting as much detail about prognosis as they had asked for initially. In early stages families and patients talked to the health carers together. In later stages family members often talked to them alone, often at the patient's request, and did not confirm the patients' exact state of knowledge. Patients and family members did not talk as openly and sheltered each other from knowledge. All reported that they complied with their relatives requests for the amount of information they wanted. Patients focused more on daily living and concerns about managing symptoms; families were more concerned with prognosis and details related to care. Almost all patients wanted to know their prognosis, and family members respected their wish to know or not, although some would have wanted to protect the	

Results	Discussion & Conclusions
patient from details regarding prognosis. No family members had requested that the patient was not fully informed.	
[14] Mitchison 2012	
<u>1a: Information needs</u> Many of the patients (from all ethnic groups) expressed a preference for oncologists to openly provide all details regarding their prognosis. Reasons for wanting to know were largely pragmatic, as patients felt the information was pertinent to their being able to plan and prepare for the future. It was more common for Anglo-Australian patients to express not wanting to be told their prognosis, because: statistics are 'inaccurate' and unnecessary to know; disclosure would cause unnecessary emotional distress; the patients' physical condition would deteriorate due to the stress. A small number of largely Anglo-Australian patients and relatives mentioned that they would prefer prognostic information 'later on' when they were ready to receive the information, however, they could still see the benefit of prognostic disclosure to prepare for death. <u>1b. Role and needs family</u> Discordance with patient wanting to know their prognosis and the family not wanting prognosis disclosed occurred almost exclusively within migrant sub-samples. In contrast, family-members of Anglo-Australian patients usually supported the patient's wish to have their prognosis disclosed or not.	Anglo-Australian patients often expressed a desire to *not* be told their cancer prognosis. However, some did mention that they would eventually want to know their prognosis. Usually there was concordance in views between Anglo-Australian family members and patients in communication preferences.

Results	Discussion & Conclusions
Discussing prognosis only in a separate meeting with the relatives was not expressed as preferential by any of the patients.	
[15] Oosterveld-Vlug 2017	
1c. Non-Western patients *Circle of hope:* Muslims regarded it as unacceptable when physicians consciously gave false hope by providing unrealistic information or withholding realistic information (i.e. a circle of hope). However, hope was found to play a different role for Muslims. They pointed out that they always keep their hopes up and rely on their faith in Allah, who is the decider when it comes to life and death. *Combining Hopeful and Realistic Information:* Muslim participants reported that they prefer physicians to give realistic information rather than unrealistic but hopeful information. Most participants with a Muslim background preferred that physicians provide realistic information to relatives first. Thereafter, open and explicit communication with the patient does not always occur as family members sometimes choose to not confront the patient with his/her poor prognosis and the fact that they are nearing death. In addition, Muslim participants detailed how a physician could best communicate that a patient is nearing death: they should inform the patient and/or relatives that they have no curative treatments available, but they should never state that a patient has an "incurable illness," because physicians are not the ones who decide the question of life and death. *Shifting of hope:* Muslim participants expressed a preference to involve an imam or Muslim spiritual	1c Non-Western patients When realistic information from a medical perspective is introduced in a culturally sensitive way (e.g., not by stating that a patient is incurably ill, but by informing the patient that the physician himself no longer has any available treatment options), hope can be maintained.

Results	Discussion & Conclusions
counselor when the patient was aware of his/her terminal illness and to facilitate end-of-life communication.	
[16] Rohde 2019	
1. Patient needs The participants' hopes seemed to change from before they were diagnosed with their incurable disease and through their disease trajectory. Physicians and nurses at the cancer centre conveyed that they would try to delay disease progress and relieve pain and symptoms. Even though they recognised that their cancer was incurable, most participants hoped that they would be among those who could live for years despite a poor prognosis. As the disease progressed, they hoped for good days, not extraordinary things or experiences, and for some participants there seemed to be a change in goals and values. 1a. Information needs Correct and truthful information about likely future prospects was important for the participants. Preferences varied regarding the amount of information they wanted to receive and at which time point. Some participants wanted a total overview of their disease and prognosis from the start, some wanted a smaller amount of information at that time, while others wanted their body to tell them how their disease was progressing. Some participants found vague information about likely prospects confusing.	1. Patient needs The realistic hope for most of our participants was that something could be done to relieve their symptoms and potentially to postpone death, and to enable them to lead ordinary everyday lives and have the possibility of spending time with family and friends. Therefore, the participants emphasised the importance of HCPs including hope in their communications of disease, prognosis and life expectancy throughout the disease trajectory.
[17] Walczak 2013	
1. Patient needs *Skills, understandings and relationship elements:* Patients identified important doctor skills when	1a. Role and needs family Participants in this study also noted the important role of

Results	Discussion & Conclusions
discussing prognosis. These included maintaining a calm and open manner in all contacts with the patient, treating the patient as an individual and being sensitive to their individual needs. Participants also indicated that control of discussions should be actively given to the patient, but that the doctor should also take the initiative to raise complex or difficult topics such as prognosis and end-of-life issues. In discussing these issues and responding to patients' questions, participants felt that doctors should be honest, acknowledge and explain uncertainty where it exists, and relate the stories of other patients to foster hope and illustrate uncertainty. Also contributing to adjustment and acceptance was a good doctor/patient relationship that was characterised by patients as a feeling of comfort and trust in their doctor. Finally, a clear and explicit agreement and permission from both parties to discuss these complex and difficult topics was highlighted as an important step towards readiness to discuss end-of-life issues. Patients recognised that not only was it important for the doctor to invite discussion of prognosis and end-of-life issues, but also that the patient needed to give their doctor permission to raise these issues as well.	family in shaping patients acceptance and readiness to discuss prognosis and end-of-life issues.

Supplement 5: Table 3. Synthesis of findings

Synthesis of findings	**Summary of evidence**
Topic: theme 1. Patient needs: Honest communication with empathy	
Overall, studies showed that patients desire prognostic information to be disclosed in an open, honest, and straightforward manner without being blunt and with empathy [1, 3, 4, 13, 14, 17].	- Most patients wanted prognostic information to be disclosed in a straightforward, honest manner, if desired [1]. - Several patients said that it is important to be honest when discussing the future, without being too blunt. None indicated that they did not want their HP to be honest [3]. Patients said that it is vital for the HP to show compassion and respect, some spoke of the devastating effect of having bad news broken when the doctor did not show any signs of compassion [4]. - Patients prefer realistic information, emotional support and the physician not being avoidant [12]. - When discussing prognosis patients desire honesty and directness, but with empathy [13]. - Many patients preferred to openly be provided with all details on their prognosis [14]. - Patients prefer their doctor to be honest and acknowledge uncertainty where it exists when discussing their prognosis [17].
Topic: theme 1. Patient needs: Hope- and hope-giving	
Hope has been reported as important in prognostic communication to help counterbalance patients' need for the truth. Prognostic discussion can help patients redefine hope for a cure to hope consistent with	- Hope was seen as a vital part of prognostic discussions [1]. - Patients stated that hope can be nurtured by reassuring patients that pain and other symptoms can be controlled, emotional support, knowing that they will not be abandoned, and information about equipment and resources. But patients also underscored that it is important for HPs not to give false hope but any positive aspects should be emphasized. A few patients spoke of the hope of

Synthesis of findings	Summary of evidence
personal goals like being with family or being well cared for [1, 3, 6, 13, 16]. Hope can be supported in a number of ways: emphasizing the holistic nature of palliative care [3, 6, 12, 16]; reassurance of non-abandonment [3, 6].	beating the odds and being on the tail of the survival curve [3]. - Patients perceived the holistic approach of palliative care aimed at physical, emotional, and spiritual health needs of participants as hope-giving. This information also helped them redefine their hope [6]. - Patients prefer to hear information about palliative care while discussing prognosis [12]. - Patients expressed a continuing need for hope [13]. - Patients' redefined their hope in line with their new goals, like spending time with their families. Emphasis on care options to delay death or relieve symptoms helped support hope [16].
Topic: theme 1. Patient needs: Trusted expert physician	
Patients prefer the prognosis to be communicated by a physician they know, trust, feel comfortable with, and consider an expert [1, 4, 12, 13, 17].	- Patients wanted to hear their prognosis from their oncologist whom they knew and trusted [1]. - Patients strongly emphasized the importance of being comfortable with their HP when discussing prognosis [4]. - Patients preferred a physician they considered to be an expert to discuss their prognosis with them [12]. - Patients desire their prognosis to be disclosed by someone they perceive to be an expert [13]. - Patients wanted a feeling of comfort and trust in their doctor when discussing prognosis [17].
Topic: theme 1. Patient needs: Physician initiative	
Studies show that the physician can take the initiative to broach the subject of life expectancy, as long as	- Provided the patient is given the option not to hear the prognosis and the topic is broached in a sensitive manner, most participants felt that it was appropriate and important for the doctor to make this an accessible topic, because the patient might find it difficult to raise it themselves [4].

Synthesis of findings	Summary of evidence
patients are given the option to say no [4, 17].	- Patients felt that the doctor should take the initiative in raising the topic of prognosis, but should leave the patient in control whether to discuss it or not [17].
Topic: theme 1. Patient needs: Respecting cultural values	
Tailoring information also encompasses respecting the cultural values of patients and their families by 1) exploring differences in values between healthcare professionals and the patient and their family, and how these might lead to different communication needs, 2) acceptance of a more central role of the family in the communication and care process [8–10, 15].	- It is recommended that HP's their own perceptions and practices in perspective, and consider the religious and cultural views of their patients and family members when discussing prognosis with Muslim patients [8]. Miscommunication around palliative care involves more than different cultural backgrounds and language problems; it may also be caused by the triangular form of communication between HP's , Muslim patients and their relatives [9]. The outcome is not a simple one-to-one communication between an autonomous patient and an all-knowing professional, the social environment of the Muslim patients plays an important role. This study calls for more sensitivity to the care beliefs and demands of ethnic minorities [10]. - When realistic information from a medical perspective is introduced in a culturally sensitive way (e.g., not by stating that a patient is incurably ill, but by informing the patient that the physician himself no longer has any available treatment options), hope can be maintained [15].
Topic: theme 1. Patient needs: Spiritual support	
Spiritual support, if desired by the patient, can help support a patient's hope [6]. If needed, a priest [4], imam [15], or spiritual counsellor can help facilitate communication on life expectancy and	- One carer said her husband wanted their priest and not the doctor to deliver any bad news and had requested this be documented in the medical record [4]. - Spiritual support was considered a part of holistic, palliative care that supported hope [6]. - Muslim participants expressed a preference to involve an imam or Muslim spiritual counselor when the patient was

Synthesis of findings	Summary of evidence
help patients and their family make the transition from hope for a cure to hope for a good death.	aware of his/her terminal illness and to facilitate end-of-life communication [15].
Topic: theme 1a. Information needs: Tailored information	
Information needs of patients differ and prognostic discussion should be tailored to each patient's needs, some want more explicit prognostic information and time frames whereas others desire a more general indication [1, 2, 4, 7, 11–14, 16]. Simply asking how much patients want to know without explaining what kind of information is available and exploring their emotions and concerns, might not sufficiently elicit informational needs [1, 7, 11]. Statistics and time frames should be used cautiously, not all patients wanted to hear them because they feared they could potentially cause distress and threaten	- Patients felt that doctors should explore what information they want and how such information might most usefully be imparted to them. The end result of such a discussion may be far from a survival curve. Statistics, especially a time frame, were seen as potentially hope destroying and wanted to hear "good news" stories [1]. - Not all patients wanted detailed information about their life expectancy. Some wanted a survival time frame, but many others wanted only a general indication. Those patients who wanted to be given a time frame mostly wanted to know how long the average person with their condition would live and/or be given a rough range. A few spoke of the hope of beating the odds and being on the tail and of the survival curve, and they wanted positive aspects to be emphasized. Patients also said that it is important to explain that statistics apply to a group so they can only be used as a guide. Patients and carers wanted their HPs to highlight that every person is an individual and that people's experiences are different even with the same disease [2, 4]. - Patients and family responded that they wanted "all the information." However, in further questioning, a substantial minority of participants made it clear that they did not want explicit information about prognosis such as a median survival or estimated life expectancy. Simply asking patients how much information they want, without exploring their emotions and concerns, did not adequately elicit informational needs. Some patients favored a more indirect

Synthesis of findings	Summary of evidence
their hope (1,14). Additionally, patients emphasized it should be explained that statistics are inaccurate and apply to groups rather than individuals (2,14). Finally, some patients preferred for positive aspects to be emphasized and obtained hope from good news stories of patients who lived longer than average [1–3, 17].	approach, whereas other patients preferred more direct, full and explicit approaches to prognostic information [7]. - All patients wanted to know the truth, but their definitions of truth varied. Some wanted a clear time limit, but others were not interested [11]. - Patients preferred information tailored to the individual while discussing prognosis [12]. - Patients wanted information to be communicated in a way that they can understand, at a rate that they can assimilate and adjusted to the level of detail they want to know [13]. - Many patients preferred open discussion of all details regarding their prognosis. However, there were also many patients who did not want to be told their prognosis because statistics are inaccurate and fear of distress; a number of them might want information later on [14]. - Preferences varied regarding the amount of information patients wanted to receive, some wanted a total overview of their prognosis from the start, whereas others wanted a smaller amount of information at that time. Uncertainty should be acknowledged, but stories of other patients could also foster hope [17].
Topic: theme 1b. Role and needs family: Family for support	
The presence of family can provide the patient emotional support during prognostic discussion, but who if anyone should be present should be negotiated in advance [4, 5, 13, 17].	- Patients said that it is vital that the doctor ensure that support is present when discussing prognosis. Most patients wanted someone from their immediate family present, but felt that it was important to negotiate who should be present when bad news was given [4, 5]. - Most patients wanted family present, some did prefer this to be negotiated with them first. Almost all patients wanted to know their prognosis, and family members respected their wish to know or not, although some would have wanted to protect the patient from details regarding

Synthesis of findings	Summary of evidence
	prognosis. No family members had requested that the patient was not fully informed [13]. - Participants considered the role of the family as important for readiness of patients to discuss prognosis [17].
Topic: theme 1b. Role and needs family: Diverging information needs	
Information needs can diverge between patients and their families [2, 5, 7, 11, 13], especially their partners or informal caregivers who might feel a stronger need to plan for the future and care needs [2, 5, 13]. Some patients might not be interested in their prognosis, but this can often be discussed with their family if they desire to know and the patient has given permission [5, 7, 11]. Although family members might want to protect patients from hearing bad news about their prognosis, they respected the patients' right and wish to know [13, 14].	- Some carers said they have a different reason for needing a time frame than the patient: for example, knowing how much time to take off work and whether to call other family members to share the care-giving burden [2, 5]. Many patients said they would be happy for the HP to have a separate discussion with family members regarding their condition, most said they would want to give permission first [5]. - Some patients differed from their family members in their desire for prognostic information, f.e. with the patient not wanting to know but the partner wanting to know. In these situations participants suggested that physicians should discuss prognosis with the family [7]. - Those patients that did not want information about a time frame left knowledge about this to their family [11]. - The needs of patients and families were similar but diverged somewhat as the illness progressed. Patients focused more on daily living and concerns about managing symptoms; families were more concerned with prognosis and details related to care [13]. - There was no discordance between patients and their families regarding disclosure of prognosis as families supported patient's wish to know or not [14].
Topic: theme 1c. Non-western patients in the Netherlands: Conspiracy of silence	
Studies in the Netherlands showed	- Patients and their family want HP's not to take away hope by talking directly and openly about the negative prognosis.

Synthesis of findings	Summary of evidence
that families of non-western patients, specifically Muslim patients, can prefer to act as intermediate between patient and physician when prognosis is discussed. The family often maintains a conspiracy of silence towards the patient on the topic in order to protect the hope of the patient and because of religious taboo [8, 9, 15]. This can create tensions when juxtaposed with Dutch healthcare provider's values aimed at communicating directly with the patient and fully informing them [8].	Hope also cannot be taken away for religious reasons, since Allah decides whether someone lives or dies. Therefore families ask HP's to be cautious in giving information to the patient, but inform the family. This can be difficult for HP's since it often clashes with their values on fully informing the patient and supporting informed decision-making [8]. Due to language difficulties communication often takes the form of a triad, between HP, patient, and a relative who translates and gears decision-making to the patients' own wishes. Relatives often did not consider a professional interpreter to be acceptable, as they feared that the information provided to the patient would be too direct. Difficult topics, like prognosis, would not always be translated and communicated to the patient by relatives who decided when and to what extent the patient should be involved in the conversation. Relatives felt that care providers should convey painful messages gradually and recognize them as participants in the communication process [9]. - Muslims regarded it as unacceptable when physicians consciously gave false hope by providing unrealistic information or withholding realistic information, they prefer realistic information. However, they also preferred that physicians provide realistic information to relatives first. Thereafter, open and explicit communication with the patient does not always occur as family members sometimes choose to not confront the patient with his/her poor prognosis and the fact that they are nearing death. Hope was found to play a different role for Muslims, who always have to keep their hopes up and rely on their faith in Allah, who is the decider when it comes to life and death [15].
Topic: theme 1d. Cognitive impairment and frontotemporal dementia	
No evidence was found.	

Supplement 6: Full list of included studies

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Handreiking: Bespreken van de individuele levensverwachting bij mensen met amyotrofische laterale sclerose en hun familie/naasten

ALS Centrum Nederland

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Inhoudsopgave

1 Inleiding

1.1 Aanleiding

Bij het bespreken van de diagnose Amyotrofische Laterale Sclerose (ALS) vragen veel mensen naar hun levensverwachting. Tot op heden was het alleen mogelijk een gemiddelde levensverwachting van 3-5 jaar te geven. Een predictiemodel maakt het mogelijk om op basis van een aantal kenmerken bijvoorbeeld de overleving te berekenen. In 2018 is het predictiemodel voor ALS (*Personalised ENCALS survival prediction model*) gepubliceerd. Dit model maakt het mogelijk om op basis van acht ziektekenmerken de individuele levensverwachting beter in te schatten en meer te personaliseren (1). Het predictiemodel is uitsluitend geschikt voor patiënten met ALS, niet voor patiënten met Progressieve Spinale Musculaire Atrofie (PSMA) of Primaire Laterale Sclerose. Voor meer informatie over het model verwijzen wij u naar de website van het ALS Centrum Nederland (www.als-centrum.nl; zoek op levensverwachting).

Uit onderzoek komt naar voren dat 66% van de mensen met ALS meer informatie zou willen over hun individuele levensverwachting (1). Voor artsen is het bespreken van de levensverwachting vaak lastig en stressvol, zeker als deze ongunstig is (2,3). Zo zijn artsen bezorgd om patiënten en hun familie/naasten hoop te ontnemen en stress te bezorgen (4,5). Ook is vaak onduidelijk wat patiëntbehoeften zijn voor het bespreken van de levensverwachting. Dit kan ertoe leiden dat het onderwerp door artsen vermeden wordt (2,6,7). Deze zorgen zijn zowel nationaal als internationaal (8) geuit in reactie op het nieuwe predictiemodel. Op basis van onderzoek is er echter geen reden om aan te nemen dat het bespreken van de levensverwachting een negatief effect heeft op het mentaal welbevinden of de hoop van patiënten (zie paragraaf 1.2).

Om deze redenen heeft het ALS Centrum Nederland besloten een werkgroep “Bespreken individuele levensverwachting” op te zetten. Deze werkgroep kreeg de taak de implementatie van het predictiemodel zorgvuldig te begeleiden. Hiertoe heeft de werkgroep besloten deze handreiking op te stellen.

1.2 Wetenschappelijk bewijs effect bespreken levensverwachting

Voorafgaand aan het opstellen van de handreiking heeft de werkgroep literatuuronderzoek gedaan naar gepubliceerd wetenschappelijk onderzoek over het effect van het bespreken van de levensverwachting op patiënten met een levensbeperkende aandoening. Op basis van dit literatuuronderzoek concludeert de werkgroep dat het bespreken van de individuele levensverwachting geen negatief effect heeft op het mentaal welbevinden (d.w.z. angst en depressie) (9,10) of hoop (11,12) van de patiënt. Het bespreken van de levensverwachting kan zelfs een positief effect hebben op de patiënt-arts relatie (13) en patiënttevredenheid over de communicatie (10,14). Daarnaast kan het de besluitvorming (12,15,16), plannen van de toekomst (15,17) en het

gevoel van controle (17,18) bij de patiënt ondersteunen. Het ontwijken van het onderwerp daarentegen kan een negatieve impact op hoop hebben (19) en kan angst vergroten (20). Echter, niet alle patiënten willen hun levensverwachting weten. Uit studies blijkt dat het effect afhankelijk is van patiëntbehoeften: *of*, *wanneer*, *hoeveel* en *wat* de patiënt wil weten over de individuele levensverwachting (11,12,15,17,18).

1.3 Doelstellingen

Deze landelijke handreiking biedt neurologen en revalidatieartsen tips en adviezen voor het bespreken van de individuele levensverwachting op een manier die zo goed mogelijk aansluit bij de individuele voorkeuren en behoeften van mensen met ALS en hun familie/naasten. Het doel hiervan is drieledig:

1. Versterken vertrouwen en geven van houvast voor het bespreken van de individuele levensverwachting.

2. Het geven van tips en adviezen voor het invullen en interpreteren van het *ENCALS* predictiemodel.

3. Vergroten van vaardigen in het bespreken van de levensverwachting afgestemd op de individuele behoeften van mensen met ALS en hun familie/naasten.

Deze handreiking is bedoeld als hulpmiddel, niet als protocol.

1.4 Doelgroep

Deze handreiking is bedoeld voor neurologen en revalidatieartsen betrokken in de begeleiding van patiënten met ALS.

1.5 Aanpak

Een multidisciplinaire werkgroep bestaande uit neurologen, revalidatieartsen en onderzoekers heeft deze handreiking opgesteld. Een expertpanel is gevraagd om feedback te geven op de handreiking. Dit expertpanel bestond uit twee patiënten, een naaste, een externe revalidatiearts, een ethicus, een geestelijk verzorger met een islamitische achtergrond, en een neuroloog gespecialiseerd in FTD.

Voor het opstellen van de handreiking zijn de volgende stappen gevolgd:

1) Inventarisatie door de werkgroep van de belangrijkste knelpunten in het bespreken van de levensverwachting.

2) Formuleren van onderzoeksvragen en uitvoeren van literatuuronderzoek om deze te beantwoorden.

3) Opstellen van de handreiking door de werkgroep op basis van literatuur, klinische expertise en interne consensusbesprekingen.

4) Revisie van de handreiking op basis van meerdere consultatierondes van het expertpanel.

1.5.1 Vervolg: toetsing in de praktijk

Het bespreken van de individuele levensverwachting bij ALS met behulp van deze handreiking wordt op dit moment ook in de praktijk getoetst. Dit gebeurt met behulp van een kwalitatief onderzoek. In dit kwalitatieve onderzoek worden patiënten met ALS (en hun naasten) geïnterviewd over hun ervaringen met het bespreken van de levensverwachting op basis van het predictiemodel en met behulp van deze handreiking. Op basis van de resultaten uit dit onderzoek zal de handreiking waar nodig worden aangepast.

1.6 Knelpunten

I. Invullen en interpreteren van het predictiemodel:
   a. invullen van het model;
   b. wat te doen bij missende, incorrect of onduidelijke waarden;
   c. interpreteren van de uitkomsten van het model;
   d. communicatie van de resultaten;
   e. onzekerheid rondom het model en individuele levensverwachting;
   f. timing bespreken levensverwachting.

II. Aansluiten bij de individuele behoeften en voorkeuren van patiënten met ALS en hun familie/naasten tijdens het bespreken van de individuele levensverwachting:
   a. informatiebehoeften van de patiënt;
   b. rol en behoeften van de familie/naasten;
   c. niet-westerse patiënten in Nederland;
   d. patiënten met (ernstige) cognitieve beperkingen en/of ALS-FTD.

De adviezen voor de onder I genoemde knelpunten zijn geformuleerd op basis van expertopinie en consensusbesprekingen. De adviezen voor de onder II genoemde knelpunten zijn geformuleerd op basis van wetenschappelijk bewijs, expertopinie en consensusbesprekingen.

Voor de behoeften van patiënten met ernstig cognitieve beperkingen en/of ALS-FTD voor het bespreken van de levensverwachting is geen literatuur gevonden.

1.7 Inhoud

De volgende onderwerpen zullen in deze handreiking aan bod komen:

1 informatie over de bespreking van de individuele levensverwachting tijdens de diagnosedag, zoals opgenomen in de diagnosebrief van de neurologie in het UMC Utrecht;

2 tips voor het invullen van het predictiemodel;
3 adviezen voor het interpreteren van de uitkomsten van het predictiemodel;
4 adviezen hoe aan te sluiten bij individuele behoeften van patiënten;
5 adviezen en tips voor het bespreken van de resultaten van het model met patiënten.

2 Diagnosebrief van de neurologie

In de diagnosebrief van de neurologie in het UMC Utrecht zijn twee passages opgenomen over de individuele levensverwachting. De eerste passage is standaard en bevat alle relevante ziektekenmerken voor het invullen van het predictiemodel. De tweede passage vermeldt of de individuele levensverwachting met de patiënt is besproken en, indien dit het geval is, wat er met de patiënt is besproken.

[*Standaard passage*]

De diagnose ALS werd met patiënt besproken. Wij bespraken dat er geen medicijn is om de ziekte te genezen. Hierbij werd verteld dat de gemiddelde levensverwachting 3-5 jaar is, maar dat dit tussen patiënten sterk varieert. Recent onderzoek heeft aangetoond dat het mogelijk is een inschatting te maken van de overleving van individuele patiënten o.b.v. de ziektekenmerken.

De mogelijkheid om meer genuanceerd de levensverwachting te bespreken op basis van individuele ziektekenmerken is wel/niet* ter sprake gekomen.

Patiënt gaf aan hier wel/(nog) geen* behoefte aan te hebben.**

[Tweede passage: Alleen van toepassing als levensverwachting wel met patiënt is besproken]

Met de huidige wetenschap en op basis van de individuele ziektekenmerken valt patiënt in de groep met een veel kortere/kortere/gemiddelde/langere/veel langere* overleving. Op verzoek van patiënt is dit besproken, waarbij wij ook benoemden dat een deel van de patiënten beduidend langer leeft dan de (voorspelde) gemiddelde overleving. **

**(weghalen wat niet van toepassing is)*

*** (weghalen indien de levensverwachting niet ter sprake is gekomen)*

3 Invullen en interpreteren van het predictiemodel

Het predictiemodel is online beschikbaar en te vinden op www.encalssurvivalmodel.org. Om gebruik te kunnen maken van het model op deze website is registratie nodig. Houd er rekening mee dat verwerking van de registratie enkele dagen kan duren.

3.1 Invullen predictiemodel

In de velden onder *patient characteristics* kunnen de ziektekenmerken ingevuld worden; zie tabel 1 hieronder voor alle relevante ziektekenmerken. Deze ziektekenmerken kunnen in de diagnosebrief terug worden gevonden. Op basis hiervan geeft het predictiemodel een inschatting van de levensverwachting.

Let op: Hier kunnen alleen de kenmerken op het moment van diagnose worden ingevuld. Het model is niet geschikt om in de loop van het ziektetraject de prognose opnieuw te berekenen met andere waarden dan vastgesteld bij de diagnose. Het predictiemodel is alleen geschikt om de individuele levensverwachting te schatten van patiënten met ALS, niet voor patiënten met PSMA of PLS. Wanneer de diagnose later is bijgesteld (bv van PSMA naar ALS) kan het model wel gebruikt worden (zie tip 3.1.1h).

De velden geboortedatum, datum eerste symptomen, diagnosedatum, ALSFRS-R (totaalscore, bij diagnose) en VC (%, bij diagnose) hebben de grootste invloed op de uitkomst van het model. Voor meer informatie over het relatieve belang van alle kenmerken verwijzen wij u naar het wetenschappelijke artikel waarin de ontwikkeling en validatie van het *ENCALS* predictiemodel wordt beschreven (1).

Tabel 1: Relevante ziektekenmerken *ENCALS* survival model (bij diagnose)

Velden	Waarde
Date of birth (geboortedatum)	jjjj/mm/dd *
Date of onset (datum eerste symptomen)	jjjj/mm/dd *
Date of diagnosis (diagnosedatum)	jjjj/mm/dd *
ALSFRS-R	0-48 punten, totaalscore bij diagnose
C9orf72 repeat expansion (C9orf72)	wel / niet aanwezig / nog nader onderzoek nodig
Definite ALS	ja / nee
Frontotemporal dementia (frontotemporale dementie; FTD)	ja / nee / nog nader onderzoek nodig
Site of onset	spinaal / bulbair
Forced vital capacity (vitale capaciteit; VC)	%, bij diagnose

* N.B. Bij het invullen van een datum in het model vult u eerst het jaartal in, dan de maand en als laatste de dag.

In de appendix kunt u een voorbeeld vinden van het model waarbij de gegevens van een fictieve patiënt zijn ingevuld.

3.1.1 Tips bij het invullen van het predictiemodel

a. Is bij een datum alleen de maand bekend en niet de dag?
Vul dan de 15e dag van de betreffende maand in.

b. Bestaat er twijfel over de datum eerste symptomen en is er een groot verschil tussen de data?
Dit kan zeer problematisch zijn voor de resultaten van het model. In dit geval is het advies van de werkgroep om terughoudend te zijn met het bespreken van de verwachte levensverwachting en mogelijk het predictiemodel helemaal niet te gebruiken.

c. Is er goede reden om te twijfelen aan de waarde van de vitale capaciteit van de diagnose dag (bv. erg vermoeide patiënt, bronchitis)?
Dit kan een groot effect hebben op het resultaat van het predictiemodel. Het advies van de werkgroep is om dan voor de VC een latere, meer betrouwbare waarde in te vullen die kort op de diagnose dag is gemeten.

d. Moet VC zittend of liggend worden ingevuld?
Bij diagnose wordt VC altijd zittend gemeten, bij indicatie voor ademhalingszwakte kan het zijn dat VC liggend is gemeten. Indien beide waarden zijn gerapporteerd, gebruik bij het invullen van het predictiemodel dan de waarde voor liggende VC.

e. Ontbreekt één of meer van de volgende ziektekenmerken *site of onset*, *Definite ALS*, C9orf72, of FTD?
Hoewel deze ziektekenmerken een minder sterk effect hebben op de uitkomst vergeleken met bijvoorbeeld de *ALSFRS-R* of VC, is in dit geval toch enige voorzichtigheid geboden bij het invullen van het predictiemodel. Het advies van de werkgroep is om beide opties voor het ontbrekende ziektekenmerk in te vullen en te kijken wat de impact hiervan is op de verwachte levensverwachting.
N.B. *Site of onset* heeft hierbij meer impact op de resultaten dan *Definite ALS* C9orf72, en FTD.

f. Is de *site of onset* niet bulbair of spinaal?
Voor *site of onset* kan, naast bulbair/spinaal, in zeldzame gevallen ook sprake zijn van respiratoire, gegeneraliseerde of cognitieve *onset*. Het predictiemodel is alleen geschikt voor bulbaire/spinale *onset* en kan in andere gevallen niet gebruikt worden.

g. Welk cohort moet worden ingevuld?
Vul in het veld cohort Nederland in.
N.B. Indien patiënt niet de Nederlandse nationaliteit heeft, kies dan het cohort van de nationaliteit van de patiënt; staat dit cohort er niet bij, gebruik dan de optie algemeen (*other*).

h. Wat moet worden ingevuld als de diagnose van de patiënt is bijgesteld van PSMA naar ALS?

Bij patiënten met ALS die eerder de diagnose PSMA hebben gekregen, dient als datum eerste symptomen de dag waarop de patiënt de eerste PSMA symptomen vertoonde te worden aangehouden. Datum diagnose is datum van diagnose ALS. Indien dit geen concrete datum is (maar een periode beslaat), is het advies van de werkgroep om meerdere data (begin en eind van de periode) in te vullen en te kijken wat de impact hiervan is op de verwachte levensverwachting. Let op: ALSFRS-R en VC moeten wel rond of kort na datum conversie naar ALS zijn gemeten.
N.B. Indien Definite ALS, Site of onset en/of C9orf72 onbekend is, verwijzen wij u naar tip 3.1.1e.

3.2 Interpreteren uitkomsten predictiemodel

3.2.1 Uitkomsten predictiemodel

Na het invullen van de ziektekenmerken worden bij *Charts* drie uitkomsten vermeld:

a. *Survival curve* (overlevingscurve). Dit is de individuele overlevingscurve van de patiënten met deze kenmerken. Ter vergelijking wordt ook de gemiddelde overlevingscurve voor ALS gegeven.
b. *Risk group* (prognostische groep). Hier vindt u tot welke prognostische groep een patiënt met deze kenmerken behoort: zeer kort (*very short*) / kort (*short*) / gemiddeld (*intermediate*) / lang (*long*) / zeer lang (*very long*). De bijbehorende mediane overleving kunt u vinden in sectie 4.2.1.
c. *Survival probability*. Hier kunt u een idee krijgen van de overlevingskans van een individuele patiënt met deze ziektekenmerken. Deze grafiek laat ook de *interquartile range* (*IQR*) van de patiënt zien, de zwarte stip geeft een indicatie van de mediane overleving.

Adviezen van de werkgroep:

a. Gebruik bij het bespreken van de levensverwachting niet de overlevingscurve. De overlevingscurve is te complex voor patiënten om goed te interpreteren.
b. Bespreek de individuele levensverwachting van patiënten aan de hand van de prognostische groepen, de mediane overleving van de prognostische groepen of de *IQR* van de *survival probability*. Adviezen hoe u dit kunt bespreken vindt u in hoofdstuk 4.2.

Let op: het predictiemodel schat de voorspelde levensverwachting niet sinds datum van diagnose, maar vanaf datum eerste symptomen tot het eindpunt van overleving (de *composite survival outcome*). In dit model is het eindpunt van overleving gedefinieerd als NIV > 23 uur per dag, tracheostomie, of overlijden. De precieze tijdsduur tussen datum eerste symptomen en diagnose kunt u vinden onder het overzicht van de patiënt gegevens (*dashboard*).

Voor een voorbeeld van een ingevuld model met de kenmerken van een fictieve patiënt verwijzen wij u naar de appendix.

3.2.2 Onzekerheid predictiemodel en uitkomsten

a. Het predictiemodel is relatief accuraat (d.w.z. heeft een lage modelmatige onzekerheid) (1).
b. In het predictiemodel zijn interventies zoals riluzole, NIV of sondevoeding niet meegenomen als aparte factoren. Echter een deel van de patiënten waarop het model is gebaseerd hebben deze interventies wel gekregen. Het predictiemodel houdt dus wel rekening met het effect van deze interventies.
c. De voorspelde levensverwachting in de vorm van de vijf prognostische groepen en *IQR* (*survival probability*) is accuraat.

4 Bespreken individuele levensverwachting

Hieronder volgen enkele adviezen voor het bespreken van de individuele levensverwachting. Zoals bij elk gesprek in de spreekkamer zijn algemene communicatievaardigheden van belang, deze zullen hier verder niet besproken worden. Voor meer informatie over het voeren van slecht-nieuwsgesprekken verwijzen wij u naar de *Handreiking slecht-nieuwsgesprek* van het IKNL (21). Daarnaast kunnen (sommige) patiënten gebaat zijn bij spirituele ondersteuning. De IKNL-richtlijn *Zingeving en spiritualiteit in de palliatieve fase* geeft inzicht in de manier waarop vragen en behoeften van patiënten en hun familie/naasten op het gebied van zingeving en spiritualiteit kunnen worden herkend en hoe een gesprek hierover aan te gaan (22). Overweeg eventueel de hulp van een geestelijk verzorger in te roepen.

4.1 Adviezen voor het aansluiten bij de individuele behoeften

4.1.1 Algemeen

Het is belangrijk om aan te sluiten bij de individuele behoeften van de patiënt t.a.v. informatie over de levensverwachting. Informeer bij de patiënt of ze hun individuele levensverwachting willen weten. De patiënt heeft het recht om de levensverwachting niet te willen weten. Indien de patiënt hier meer informatie over wil, onderzoek dan wanneer, hoe specifiek, en op wat voor manier de patiënt dit wil bespreken.

4.1.2 Naasten en familie

Uit onderzoek (16,23) blijkt dat patiënten vaak steun ontlenen aan de aanwezigheid van naasten en familie tijdens het bespreken van de levensverwachting.

Adviezen van de werkgroep:

a. Stimuleer patiënten om een familielid/naaste mee te nemen en benadruk het belang hiervan.
b. Het kan voorkomen dat de patiënt vraagt de levensverwachting eerst met familie/naasten te bespreken (23–25). Indien zij hier behoefte aan hebben, bespreek dan de levensverwachting eerst met de familie/naasten van de patiënt.

4.1.3 Verschillen in informatiebehoefte patiënt-familie/naasten

Uit onderzoek (16,18,26,27) blijkt dat patiënten en hun familie/naasten niet altijd dezelfde informatiebehoeften hebben met betrekking tot de levensverwachting (bijv. patiënt wil levensverwachting niet weten en familie/naaste wel).

Adviezen van de werkgroep:

a. Indien de patiënt de levensverwachting niet wil weten en de familie/naaste wel, vraag dan toestemming aan de patiënt om de informatie over de levensverwachting met de familie/naaste te bespreken (18,26,28). Overleg of dit gesprek dan plaats moet vinden in afwezigheid van patiënt.

4.1.4 Patiënten met niet-westerse achtergrond

Uit onderzoek (24,25,29,30) blijkt dat het openlijk bespreken van de levensverwachting bij patiënten met een niet-westerse achtergrond niet altijd vanzelfsprekend is. Dit kan als destructief worden gezien voor de hoop van de patiënt en kan ook taboe zijn vanuit religieus oogpunt. Daarnaast kunnen familie en naasten ook een andere, meer prominente rol in de communicatie hebben. Bespreek ook met patiënten met een niet-westerse achtergrond wat de wensen zijn en hoe de familie hier in staat. Voor meer informatie zie ook *Handreiking Palliatieve zorg aan mensen met een niet-westerse achtergrond* (31).

Adviezen van de werkgroep:

a. Indien er sprake is van een taalbarrière heeft het gebruik van een professionele tolk de voorkeur boven familieleden als tolk (31). Leg uit dat professionele tolken beter in staat zijn medische termen correct te vertalen.
b. Vraag patiënten met een andere culturele achtergrond en hun familie/naasten (net als bij alle patiënten) wat de wensen en behoeften zijn voor het bespreken van de levensverwachting (24,25,30,31).
c. Familie/naasten van patiënten met een niet-westerse achtergrond kunnen een meer prominente rol hebben in de communicatie, bijvoorbeeld door de patiënt in bescherming te nemen en te verzoeken dat de communicatie via de familie verloopt in plaats van via de patiënt (24,25,30,31). Indien dit in overeenstemming is met de wens van de patiënt, bespreek de levensverwachting dan met de familie in plaats van de patiënt.

4.1.5 Patiënten met ernstige cognitieve problemen/FTD

Ongeveer de helft van de patiënten met ALS krijgt in de loop van de ziekte te maken met cognitieve of gedragsveranderingen (32). Dit kan een impact hebben op de capaciteit van een patiënt om een beslissing te nemen over het bespreken van de levensverwachting.

Adviezen van de werkgroep:

a. Bestaat het vermoeden dat cognitieve of gedragsveranderingen de capaciteit tot het maken van een beslissing over het bespreken van de levensverwachting mogelijk belemmeren? Gebruik dan een cognitieve *screener* zoals de *Edinburgh Cognitive and Behavioral ALS Screen* (*ECAS*) om meer inzicht te verkrijgen in welke domeinen mogelijk aangetast zijn (33).
b. Indien de patiënt wilsonbekwaam is om een beslissing te nemen over het bespreken van de individuele levensverwachting, vraag familie/naasten of deze hier behoefte aan hebben. Vraag hiervoor altijd toestemming aan de patiënt, ook indien het niet duidelijk is of de patiënt hier een mening over heeft.

4.2 Adviezen en gesprekstructuur voor bespreken individuele levensverwachting

Hieronder volgen eerst een aantal algemene adviezen voor het bespreken van de individuele levensverwachting. Daarna volgt een voorbeeld voor een gesprekstructuur waarbij deze adviezen zijn toegepast.

4.2.1 Adviezen voor het bespreken van de individuele levensverwachting

Adviezen van de werkgroep:

a. Vraag hoeveel de patiënt wil weten en sluit aan bij de behoefte van de patiënt.
b. Maak onderscheid tussen drie stappen die oplopen in mate van detail:
    i. **Prognostische groep**: veel korter, korter, gemiddeld, langer, veel langer dan de gemiddelde levensverwachting, zonder tijdsindicatie.
    ii. **Groepsgemiddelde**: Indien de patiënt behoefte heeft aan een tijdsindicatie, gebruik hiervoor dan het groepsgemiddelde van de prognostische groep waartoe de patiënt behoort: zeer kort (1,5 jaar) / kort (2 jaar) / gemiddeld (3 jaar) / lang (3,5 jaar) / zeer lang (7,5 jaar). Bespreek dit niet als precieze tijdsindicatie, maar geef aan dat de levensverwachting binnen de groep sterk varieert (zie 4.2.2). Uit onderzoek blijkt dat patiënten hieraan de voorkeur geven (15,23).
    iii. ***Interquartile range*:** Indien de patiënt behoefte heeft aan een meer individuele inschatting van de levensverwachting, gebruik dan de *IQR* zoals te vinden onder de optie *survival probability*. Gebruik de 75^{e} en 25^{e} percentiel om de grenzen aan te geven (in de appendix vindt u een uitgewerkt voorbeeld; zie ook 4.2.2 hoe de *IQR* te bespreken).

c. Benadruk dat de levensverwachting nooit een precieze tijdsindicatie is, maar een schatting waarbij het ziektebeloop voor elke patiënt anders is (individuele onzekerheid). Daarom leeft de helft van de patiënten langer dan het groepsgemiddelde. Wijs patiënten op de lange staart (zie figuur 2 en 3 in de appendix) en benadruk dat de helft van de patiënten langer leeft dan het gemiddelde; waarvan sommige patiënten veel langer. Uit onderzoek blijkt dat patiënten hieraan hoop kunnen ontlenen (11,15,17,27).
d. Indien gewenst kan de figuur met de verschillende prognostische groepen gebruikt worden tijdens het bespreken van de levensverwachting met de patiënt (zie figuur 3 in de appendix). Dit figuur geeft inzicht in a) de relatie tussen de verschillende groepen, b) de overlap tussen de groepen, c) de spreiding binnen de groepen waarbij de helft voor en de helft na de mediane overleving valt, d) de lange staart van elke groep.

4.2.2 Voorbeeld gespreksstructuur voor het bespreken van de individuele levensverwachting

Hieronder geven we een voorbeeld voor de gespreksstructuur die gebruikt kan worden voor het bespreken van de individuele levensverwachting.

i. Prognostische groep

- "Kijkend naar de kenmerken van uw ziekte valt u in de groep met een [veel korter dan gemiddelde / korter dan gemiddelde / gemiddelde / langer dan gemiddelde / veel langer dan gemiddelde] levensverwachting."
- "Voor elke groep geldt dat de helft van de mensen in die groep langer leeft dan het gemiddelde, waarvan sommige mensen veel langer."

ii. Groepsgemiddelde

- "In deze groep overlijdt de helft van de mensen in de eerste [1,5 jaar (veel korter dan gemiddelde) / 2 jaar (korter dan gemiddelde) / 3 jaar (gemiddelde) / 3,5 jaar (langer dan gemiddelde) / 7,5 jaar (veel langer dan gemiddelde)] van de ziekte."
- "De andere helft van de mensen leeft dus langer, waarvan sommige mensen veel langer."

iii. *Interquartile range*

- "Van de patiënten met uw ziektekenmerken overlijden twee op de vier patiënten tussen de … maanden en … maanden." [Vul hier de *IQR* van de *survival probability* in; zie appendix voor een voorbeeld.]
- "Eén op de vier patiënten komt echter eerder te overlijden, maar één op de vier patiënten leeft langer, waarvan sommigen zelfs veel langer."

5 Appendix: Voorbeeld ingevuld predictiemodel

Hier onder vindt u een voorbeeld van een ingevuld predictiemodel op basis van de kenmerken van een fictieve patiënt (zie Tabel 2). Het cohort is op Nederland gezet.

Tabel 2: Kenmerken fictieve patiënt

Velden	**Waarde**
Date of birth (geboortedatum)	1954-01-01
Date of onset (datum eerste symptomen)	2019-07-13
Date of diagnosis (datum van diagnose)	2020-05-07
ALSFRS-R	44
C9orf72 repeat expansion	Afwezig
Definite ALS	Nee
Frontotemporal dementia (FTD)	Nee
Site of onset	Spinaal
Forced vital capacity (VC)	100

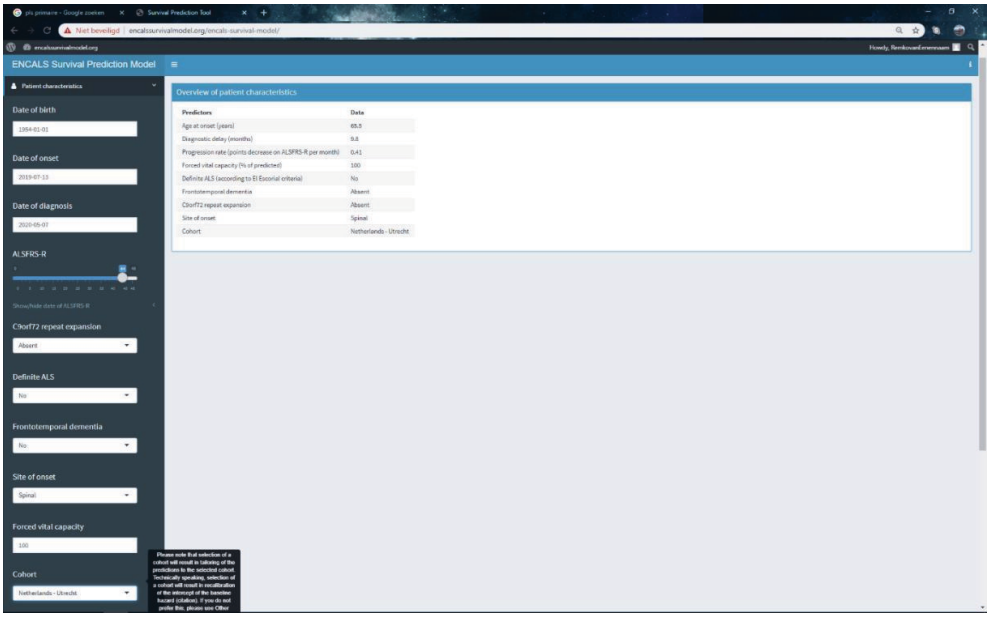
N.B. Bij het invullen van een datum in het model vult u eerst het jaartal in, dan de maand en als laatste de dag.

Hier onder in figuur 1 ziet u overzichtsscherm met daarin 1) aan de linkerzijde de ingevulde kenmerken, en 2) onder *Overview of patient characteristics* het overzicht van de kenmerken van deze patiënt.

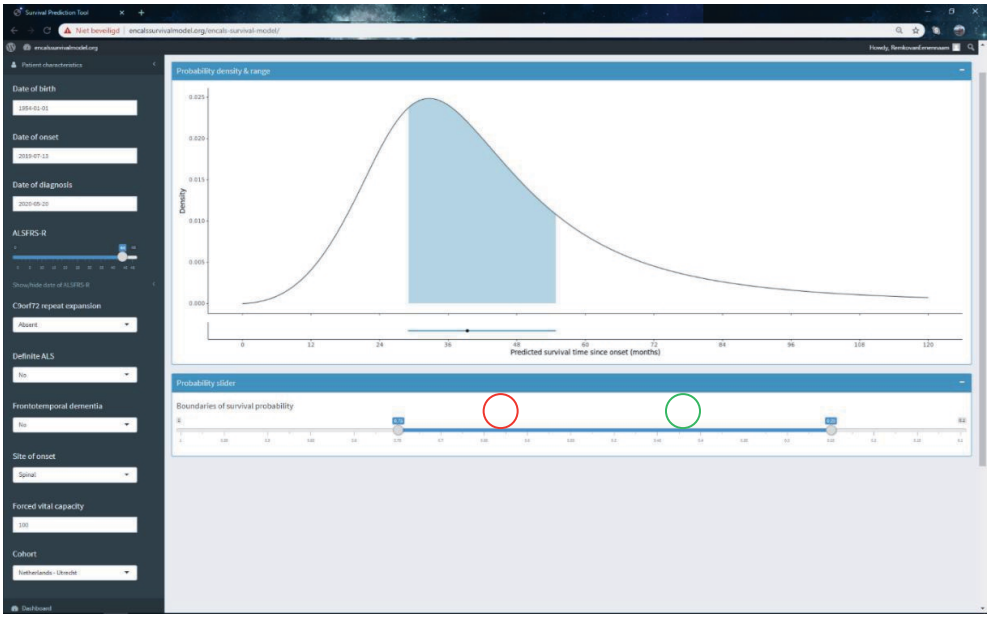
Deze patiënt valt in de prognostische groep met een langer dan gemiddelde overleving (*long*).

In figuur 2 ziet u de *survival probability* en *IQR* van deze fictieve patiënt. Onder de grafiek ziet u de p*robability slider*. Dit is de *IQR* en deze staat automatisch op 0.75 t/m 0.25. Daar boven ziet u de grafiek *Probability density & range*. Het blauwe deel onder de curve is de *IQR*, deze staat gelijk aan de blauwe streep er onder. Met behulp van de blauwe streep kunt u het aantal maanden aflezen dat bij de *IQR* hoort op de schaal *Predicted survival time since onset (months)*. De 75^{e} percentiel (rode cirkel aan de linkerkant) valt ongeveer gelijk met 29 maanden en de 25^{e} percentiel (groene cirkel aan de rechterkant) met 55 maanden. (N.B. deze cirkels vindt u niet terug in het predictiemodel.) De zwarte punt op deze blauwe lijn is de mediaan.

Voor deze patiënt geldt dus dat twee op de vier patiënten met deze kenmerken overlijdt tussen 29 en 55 maanden na begin eerste symptomen. Eén op de vier patiënten overlijdt voor 29 maanden en één op de vier overleeft langer dan 55 maanden, waarvan sommige veel langer (te zien aan de lange staart).

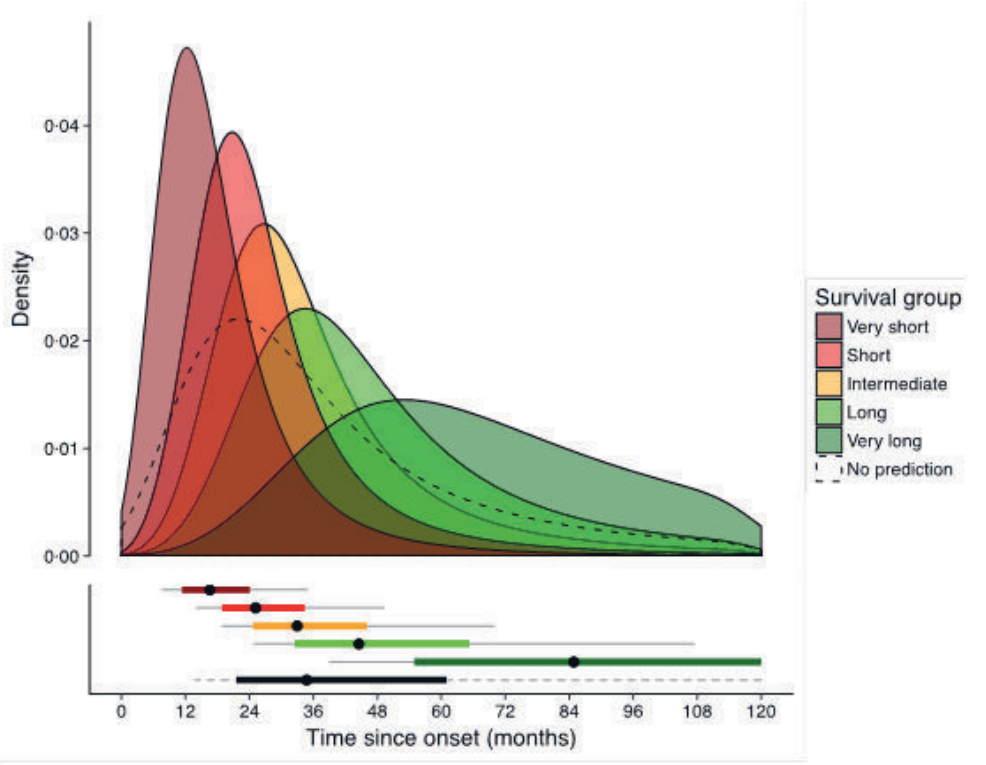


Figuur 1: Overzicht ingevulde ziektekenmerken.



Figuur 2: *Survival probability* en *IQR*.

In figuur 3 ziet u een overzicht van de vijf prognostische groepen afkomstig uit het wetenschappelijke artikel over de ontwikkeling en validatie van het *ENCALS* predictiemodel (1). Onder de grafiek op de schaal *Time since onset* ziet u de *IQR* en mediane overleving (zwarte stip) van de prognostische groepen.



Figuur 3: Overzicht prognostische groepen met *IQR* en mediane overleving (1).

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CHAPTER

3

Discussing personalized prognosis of survival in amyotrophic lateral sclerosis: a qualitative study of patients, caregivers and physicians

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Abstract

The ENCALS survival prediction model offers patients with amyotrophic lateral sclerosis (ALS) the opportunity to receive a personalized prognosis of survival at the time of diagnosis. We explored experiences of patients with ALS, caregivers, and physicians with discussing personalized prognosis through interviews with patients and their caregivers, and in a focus group of physicians. Thematic analysis revealed four themes with seven subthemes; these were recognized by the focus group. First, tailored communication: physician's communication style and information provision mediated emotional impact and increased satisfaction with communication. Second, personal factors: coping style, illness experiences, and information needs affected patient and caregiver coping with the prognosis. Third, emotional impact ranged from happy and reassuring to regret. Fourth, regaining control over the future: participants found it helpful in looking towards the future, and emphasized the importance of quality over quantity of life. Personalized prognosis can be discussed with minimal adverse emotional impact. How it is communicated—i.e., tailored to individual needs—is as important as what is communicated—i.e., a good or poor prognosis. Discussing personalized prognosis may help patients with ALS and their caregivers regain control over the future and facilitate planning of the future (care). For many patients, quality of life matters more than quantity of time remaining.

1. Introduction

Life expectancy in amyotrophic lateral sclerosis (ALS) varies greatly, ranging from months to over 10 years from disease onset (1). When receiving their diagnosis, most people with ALS are informed that, although variable, average survival is 3 to 5 years from disease onset (2). The Personalized ENCALS survival prediction model for ALS allows physicians to estimate a more personalized prognosis—i.e., expected survival in individual patients from symptom onset to death, tracheostomy, or non-invasive ventilation for more than 23 h per day—at diagnosis (3). This is especially relevant, since the prediction model shows that in about 60% of patients, average survival is either an overestimation or underestimation, which can have a negative impact on the emotional wellbeing of patients and their families (4).

Adequate and accurate discussion of prognosis in life-limiting neurological disorders is acknowledged as being important in supporting patient-centered care (5,6). Many clinical decisions and patients' choices cannot be fully informed unless the prognosis is considered (7). However, there are important barriers to prognostic disclosure. Physicians may not feel confident in delivering bad news and may fear a negative impact on patient's hope or mental wellbeing; this may even cause physicians to avoid discussing prognostic information altogether (6,8,9). Furthermore, filling out a prediction model, interpreting outcomes, and communicating numerical estimates like a prognosis in a way that is easily understandable for patients, can also seem challenging (8–10). To date, there have been no studies focusing on prognostic disclosure in neurological disease. However, studies in other life-limiting diseases, predominantly terminal cancer, show that prognosis can safely be discussed with patients and their caregivers as long as communication is tailored to their preferences and needs; this may even benefit patient decision-making and planning for the future, and provide a sense of control (13,14).

We developed a communication guide to help physicians overcome barriers to prognostic disclosure and support them in discussing the personalized prognosis in ALS with care, and tailored to patient and caregiver needs (11). However, given the absence of research on the (emotional) impact of prognostic disclosure in life-limiting neurological disorders and ALS, physicians may find it difficult to discuss life expectancy (13). Qualitative research is specifically suited to obtain deeper insight into the experiences of participants involved (14). In the present study, we explored experiences of people with ALS, their caregivers, and their physicians when discussing the personalized prognosis based on the ENCALS prediction model (3).

2. Methods

2.1. Design

This is a qualitative study using thematic analysis; data are reported in accordance with the Consolidated criteria for reporting qualitative research (COREQ) checklist (Table S1 and Table S2) (16,17).

2.2. Setting

After receiving the diagnosis of ALS from the neurologist, most patients are referred to one of 38 multidisciplinary teams responsible for ALS care in The Netherlands where ALS care is part of (rehabilitation) palliative care. ALS care teams are coordinated by a rehabilitation physician. Three ALS care teams were involved in the recruitment for this study, one associated with a university hospital (UMC Utrecht) and two with rehabilitation centers (Basalt Den Haag and Basalt Leiden).

2.3. Participants

2.3.1. Patients with ALS and Their Caregivers

Patients and their caregivers were eligible for inclusion if the personalized prognosis based on the ENCALS prediction model had been discussed with them by their neurologist or rehabilitation physician within six months of the diagnosis of ALS. The ENCALS prediction model, based on data from over 11,000 patients with ALS in population-based registers, allows physicians to estimate the personalized prediction of survival at diagnosis. The model is based on eight factors: age, El Escorial classification, site of onset, vital capacity, genetic status for C9orf72 expansion, diagnostic delay, cognitive status and functional score (3). Physicians were encouraged to use the communication guide to support them in discussing the personalized prognosis (11). Patients were recruited by physicians at three ALS care teams in The Netherlands (UMC, Utrecht; Basalt Den Haag; Basalt Leiden) using convenience sampling. Interested patients and their caregivers were sent an information leaflet on the study and contacted by one of the researchers (RvE, LK) to inform them about the study. After written consent had been provided, a date and time convenient to the participants was agreed upon for the interview within one month after discussing the personalized prognosis. Patients with PMA or PLS were not eligible for inclusion because the ENCALS prediction model is only calibrated for patients with ALS (3). Patients with ALS and frontotemporal dementia (FTD) were also included in cases where the personalized prognosis was discussed with the caregiver.

2.3.2. Physicians

All physicians who discussed the personalized prognosis and were involved in the recruitment of patients and caregivers for this study were invited to participate in a focus group.

2.4. Data collection

2.4.1. Patients and Caregivers

Semi-structured interviews with detailed probes were conducted by two researchers (RvE, LK) not involved in the care of the patients. Interviews were directed by an interview guide (Table S3). RvE has been trained to conduct qualitative research and this is his third qualitative study. LK has been coached and supervised in the conduction of interviews and qualitative analysis by RvE. Both RvE and LK were supported by a senior researcher with extensive experience in qualitative research (AB). The interview guide was formulated by two researchers (RvE, AB) and based on a literature review which was performed as part of an earlier study on the development of a communication guide (11). Interview topics included information needs (17–25), difference in experiences between patients and caregivers (19,21,22,24,27), emotional impact and hope (18,24,26,28,29), and satisfaction with prognostic disclosure (18,20,23–25,28,30). Taking patient preferences into account, the interview was face-to-face at the ALS clinic or the home of the patient (pre-COVID-19) and recorded via telephone or video-consultation.

At the start of the interview, participant characteristics were registered (gender, age, level of education, and relationship of caregiver to patient). During the interview, patients and caregivers were asked to elaborate on their experiences discussing the personalized prognosis: how and when this was discussed, the impact (emotional or otherwise), and their satisfaction with the consultation including their suggestions for improvement. Participants were offered a transcript of the interview to make corrections and additions if needed (member check).

2.4.2. Physicians

A focus group of physicians was led by two trained researchers (RvE, AB) and was directed by an interview guide (Table S4); LK, present as observer, made field notes. The focus group was recorded via video-consultation. Physicians were asked to elaborate on their experiences discussing personalized prognosis with patients with ALS and their caregivers, and to reflect on the emerging themes from the interviews (with patients and caregivers).

2.5. Data Analysis

2.5.1. Patients and Caregivers

Interviews were transcribed verbatim, anonymized, and analyzed by two researchers (RvE, LK) using an inductive approach. The process of data collection and analysis was iterative, proceeding simultaneously to provide the opportunity for important emerging topics to be incorporated into subsequent interviews. Inclusion proceeded until data saturation was reached, i.e., when no new themes emerged during the last three interviews (30). First, transcripts were read to become familiar with the narrative. Second, the texts were broken down into fragments based on their content and coded independently by two

researchers (RvE, LK) in NVIVO 12 (NVivo Qualitative Data Analysis Software; v. 12.6) using open coding (31). Resulting codes and discrepancies were compared and discussed to enhance credibility of the results and minimize interpretation bias. Third, after every 4-5 interviews, existing codes were evaluated by the research team (RvE, LK, AB, WK) and, where necessary, recoded. Fourth, codes were sorted and categorized into overarching themes and subthemes using thematic analysis (15). A descriptive summary of each theme was written, and quotes were linked to the themes by one researcher (RvE) to express the essence of the content; themes were discussed by the research team (RvE, LK, AB, WK, EKR, MvE).

2.5.2. Physicians

The focus group was transcribed verbatim and analyzed by two researchers (RvE, LK) similarly as described above. The goal of the focus group was to explore physician experiences discussing personalized prognosis and to discuss the most important patient and caregiver themes.

3. Results

3.1. Participants

A total of 16 interviews were performed in 14 cases, involving thirteen patients and ten caregivers (eight partners and two adult children), between October 2019 and May 2021 (Table 1). Data saturation was reached after we had interviewed nine patients and six caregivers in ten cases; the recording of one interview failed due to technical issues (C6) and could not be analyzed. Four rehabilitation physicians and one neurologist were included in the focus group (Table 2). Included patients represented different age and prognostic groups (except for the very short prognostic group); most participants had received a high level of education; five an intermediate level. In one case, only the caregiver was interviewed because the patient had FTD (C1); children were interviewed separately. Interviews took between 21 and 66 min; the focus group with physicians lasted 60 min.

Table 1. Description of cases.

Case	Participant	Sex	Age	Education	Initiative to discuss	Prognostic group	Location interview	Participation
C1 *	Patient 1	Male	64	High	Physician	Long		No
	Partner 1	Female	50	Intermediate			Clinic (face to face)	Yes
C2	Patient 2	Female	57	Intermediate	Physician	Very long	Home (face to face)	Yes
C3	Patient 3	Female	69	High	Physician	Short	Home (telephone)	Yes
C4	Patient 4	Female	73	High	Patient-care-giver	Long	Home (face to face)	Yes (separate)
	Daughter 4	Female	49	High			Home (telephone)	Yes (separate)
C5	Patient 5	Male	71	Intermediate	Physician	Short	Home (telephone)	Yes
C6 **	Patient 6	Male	65	High	Physician	Long	Home (face to face)	Yes (together)
	Partner 6	Female	-	High			Home (face to face)	Yes (together)
C7	Patient 7	Male	59	High	Physician	Intermediate	Clinic (face to face)	Yes
C8	Patient 8	Male	52	High	Patient-care-giver	Long	Home (Video)	Yes
C9	Patient 9	Male	55	High	Physician	Long	Home (telephone)	Yes (together)
	Partner 9	Female	54	High			Home (telephone)	Yes (together)

C10	Patient 10	Female	68	High	Physician	Very long	Home (telephone)	Yes (together)
	Partner 10	Male	72	High			Home (telephone)	Yes (together)
C11	Patient 11	Male	56	Intermediate	Physician	Short	Home (Video)	Yes (together)
	Partner 11	Female	54	Intermediate			Home (Video)	Yes (together)
	Daughter 11	Female	24	High			Home (Video)	Yes (separate)
C12	Patient 12	Male	57	High	Physician	Short	Home (Video)	Yes (together)
	Partner 12	Female	47	High			Home (Video)	Yes (together)
C13	Patient 13	Male	79	High	Physician	Intermediate	Home (Video and telephone)	Yes (together)
	Partner 13	Female	81	High			Home (Video and telephone)	Yes (together)
C14	Patient 14	Female	77	High	Patient-care-giver	Short	Home (Video)	Yes (together)
	Partner 14	Male	81	High			Home (Video)	Yes (together)

* Patient has frontotemporal dementia; interview was only with the caregiver. ** Recording of the interview failed due to technical issues and could therefore not be included.

Table 2. Characteristics of physicians.

Physician	Sex	Age	Years of Experience with ALS	Number of Times Physician Has Discussed Personalized Prognosis *	Medical Discipline
Physician 1	Female	53	15	15	Rehabilitation
Physician 2	Female	47	15	15	Rehabilitation
Physician 3	Female	34	5	10–15	Rehabilitation
Physician 4	Female	32	1.5	5	Rehabilitation
Physician 5	Male	30	3	10–15	Neurology

* Estimation by physician.

3.2. Patient and Caregiver Themes

The analysis of the interview data revealed four overarching themes with seven subthemes (see Figure 1).

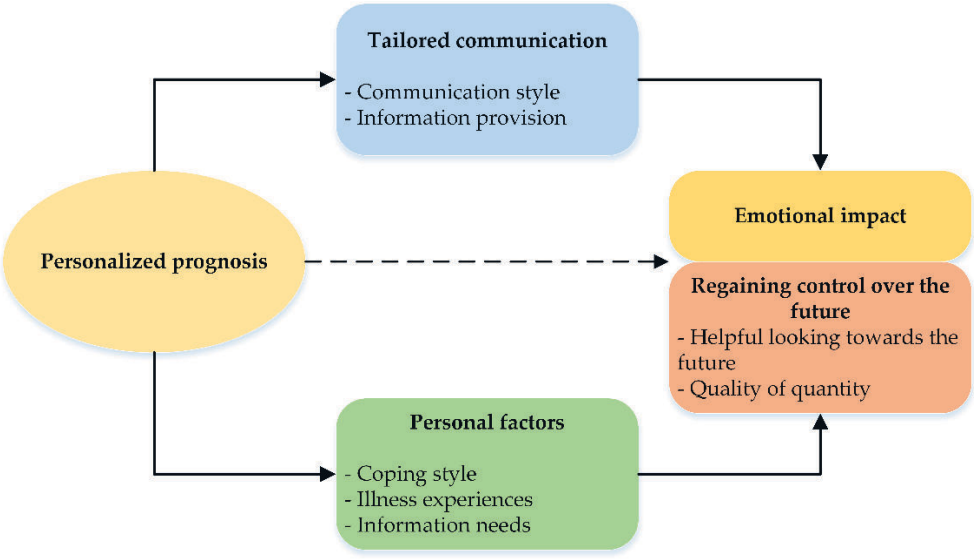

Figure 1. Overarching themes and subthemes on patient and caregiver experiences with discussing personalized prognosis in amyotrophic lateral sclerosis.

3.2.1. Tailored Communication

Communication style

Patients and caregivers emphasized the importance of a person-centered communication style tailored to their emotional needs (quotes 1, 2 in Table 3). When the physician's style did not meet their preferences, this led to dissatisfaction (quote 3).

Information provision

They also expressed their satisfaction when prognostic information was tailored to their needs (quotes 4, 5). Empathetic, tailored communication did not have to take up much time, however, patients and caregivers also emphasized the importance of adequate preparation by the physician (quote 6). Patients reported inconsistency between the information provided on the average life expectancy in ALS at diagnosis and the personalized prognosis they received later. This inconsistency could increase the negative emotional impact of bad news (quote 7, 25). Generally, the personalized prognosis was discussed as a *range* and the inherent statistical uncertainty was emphasized by the physician. The better end of this range could provide a measure of hope (quote 8). However, it could also cause confusion if the underlying prediction model and range were insufficiently explained (quote 5).

Table 3. Patient and caregiver quotes on tailored communication.

Themes and Subthemes	Quotes
Tailored communication	
Communication style	Patient 4: "It was a pleasant conversation, yes a bit cheerful though. I was fine with it and we did leave there happy. ... First, that the life expectancy was obviously longer than we originally thought. And also just the way the [the rehabilitation physician) handled the situation, yes with humor. ... I [thought] it was special how [the rehabilitation physician did her] best to assess what type of person I am and how I'm handling it all. It was apparent that that was important to her."
	Quote 1. Patient 4 (73 years old); Long prognosis
	Patient 8: "I think that is very important in a conversation like that that you are unburdened in the sense of ... we are there to constantly assist you throughout this whole process and you are not alone. ... That combination of life expectancy combined with the fact that you are not facing it alone, I do find that essential. That combination, that gave me a sense of calm."
	Quote 2. Patient 8 (52 years old); Long prognosis

Patient 12: “It really just comes down to the person giving you the news....That might also be because this doctor is less empathetic than another doctor. ... I had the impression that she found it harder to tell me than I found dealing with it. …”

Partner 12: “We have no idea what’s on the computer because she’s looking at her computer screen and we’re sitting there. ... Either let us see what’s on your computer screen or turn off your screen and write it on a piece of paper.”

Quote 3. Patient 12 (57 years old) and Partner 12 (47 years old); Short prognosis

Information provision

Patient 8: “We had a quick look at the screen together and I was able to get a look at the parameters. ... So that immediately gave me a sense of how that information is structured and what are, say, the key features. ... With that, to my mind, the matter was over and done with [laughs]. ... I think she [rehabilitation doctor] understood very well that I was interested, including in the scientific background of that life expectancy curve.”

Quote 4. Patient 8 (52 years old); Long prognosis

Partner 11: "Actually, the model is not clear to us. ... Yeah, and then when it’s said from 18 to 30 months that’s also, yeah, I think it’s almost like trying to read tea leaves.

Patient 11: “I mean look, I’m pretty happy about it [consultation], but my wife and my daughter not so much [laughs]."

Partner 11: “If she [the rehabilitation physician] herself already indicates that you have to look at that broadly then I think, so, is this false hope? False information? … I’m like yeah, but what are we taking with a grain of salt here? The 18 months or the 30 months, or the whole story?”

Quote 5. Patient 11 (56 years old) and Partner 11 (54 years old); Short prognosis

Daughter 11: “She said she was going to discuss it and then the computer didn’t work and then she had logged in somewhere else. And I think it’s pretty tough when you start giving information like that to someone, with a model like that and then that it’s not ready and then you’re waiting for it to be ready.”

Quote 6. Daughter 11 (24 years old); Short prognosis

Patient 7: "I went to [local hospital] first. That's where I got the diagnosis: ALS. And, uh, yeah they were already talking about, well, several years. ... So then I was referred here [ALS Centre diagnosis day]. And then I was told 3 to 5 years. And yesterday [at the rehabilitation physician] ... then it was 3 years. So, uh, that really has an impact. ... It's gotten worse three times."
Quote 7. Patient 7 (59 years old); Intermediate prognosis
Patient 8: "Here I was actually told three to five years, which already sounds a little better. And um, actually you don't know anything then, because of course it's a statistic, and then of course you have a spread and who knows, maybe I'm in the 96th percentile. And then I might end up with ten years. You never know."
Quote 8. Patient 8 (52 years old); Long prognosis

3.2.2. Personal Factors

The subthemes coping style, illness experiences, and information needs were strongly interrelated with each other, but generally not with role (patient or caregiver), gender, or prognosis.

Coping style

Often patients described themselves as down-to-earth and displayed an active, problem-focused coping style. They said that this coping style and knowing their personalized prognosis helped them to confront and accept their prognosis and start planning for the future instead of dwelling on their emotions (quotes 9, 10 in Table 4). Older patients and caregivers (i.e., over 65 years old) often reflected with satisfaction on a long and fulfilled life making it easier for them to accept and cope with their prognosis, regardless of whether it was good or bad news (quotes 11, 12). One patient at first exhibited an avoidant coping style, due to the death of his sibling from ALS, but later he did want to know his personalized prognosis (quote 17). Due to inconsistency of information, another patient responded with regret and denial because his personalized prognosis turned out to be bad news (quote 25). The coping styles of caregivers also varied. Some had difficulty coping with the situation (quote 10) and, as a result, did not always wish to participate in the interviews, but others wanted information about the personalized prognosis in order to regain some measure of control (quotes 13).

Illness experiences

Patients reported that, prior to prognostic disclosure, they already had an expectation about what their life expectancy would be, based on their experience with the rate of disease progression. Some described the personalized prognosis as reassuring (quote 14),

whereas others questioned its added value (quotes 15). A number of caregivers, however, said that this information was important to them because it confirmed what their partner already felt (quote 15). When the prognosis did not match the patient's feelings, they described this as surreal (quote 16). Prior illness experiences with ALS within the family and other diseases could affect how participants coped with prognostic disclosure (quotes 17, 18).

Information needs

Information needs for the personalized prognosis varied between participants. Some said they wanted as much detailed information as possible about their personalized prognosis and the underlying model (quote 19), whereas others preferred a more general indication (quote 20). Although in most cases the physician broached the topic, sometimes patients and caregivers took the initiative and requested information about the prediction model (quote 19). Some caregivers found it harder to cope with the situation and were sometimes taken aback by the patients' desire for information on the personalized prognosis (quote 19, 10), others needed clarity (quote 21, 15, 28). There were also reports by patients and caregivers that their need for information about functional prognosis was not met (quote 22).

Table 4. Patient and caregiver quotes on personal factors.

Themes and Subthemes	Quotes
Personal factors	
Coping style	Patient 7: "It was a bit intense at first, and also emotional. But then again, I'm so down-to-earth that yes, I resigned myself to it pretty quickly. ... [My wife], she's a little more emotional than I am. She's a little less down-to-earth... I accept that things are the way they are more easily."
	Quote 9. Patient 7 (59 years old); Intermediate prognosis
	Patient 11: "I like things to be clear... then you can take action, do things you still want or take care of things. … [With such a short life expectancy] you're going to get started with things sooner and find things out a little faster to see what needs to get done. … You distract yourself a little bit that way."
	Partner 11: "Yeah, I was in denial. In particular, not being ready to get this news. ... I'm just like, we'll see what's coming and then we'll just deal with it and I don't need to know when that will be."

Quote 10. Patient 11 (56 years old) and Partner 11 (54 years old); Short prognosis

Patient 13: "I'm not afraid to die, that's a very important principle. I don't think it's time to die yet, but once you get to 80, we do say 'up to 80 is wonderful, but 80 to 100 sucks' [laughs]. Once you reach your 80th birthday, you're increasingly faced with deterioration. ... It's not dramatic that my life is finite."

Partner 13: "It's just the way it is and I'm not going to worry about it. … I want to take care of him for as much as I can and I will do that with love. ... So, we'll just live for now and enjoy life every day."

Quote 11. Patient 13 (79 years old) and Partner 13 (81 years old); Intermediate prognosis

Patient 14: "Our oldest son passed away very suddenly just before he turned 20. That's the biggest disaster that can happen to you. After that all disasters pale in comparison. ... I'm 77 and I've had a very long life. A lot of people don't even get that old. I have wonderful memories so it's been nice."

Quote 12. Patient 14 (77 years old); Short prognosis

Partner 12: "I am an extreme control freak [laughs] both in my work and in my personal life ... and I don't function as well when I know that there are unanswered [issues]."

Quote 13. Partner 12 (47 years old); Short prognosis

Illness experiences

Patient 8: "I was like, 'I'm going to make it those three years,' because I'm actually feeling incredibly good right now. Very fit and spry. I actually have no complaints right now. So I feel like I can last a while. Well, that was kind of confirmed by this news. So in that sense, of course, that's only positive."

Quote 14. Patient 8 (52 years old); Long prognosis

Patient 14: "Well, I made an estimate myself by looking at how fast things are deteriorating and since that was pretty fast, I thought, well, it's not going to take very long then. I'm not going to make it four years, but I probably won't make it one year either. ... It makes little difference to me. …"

Partner 14: "I have now received confirmation of what [my partner] thought. So there's also no reason to let anything give us false hope or anything. ... I have to arrange all kinds of things for the future. I actually

need to stay just one step ahead of her disease, which is worsening, for example with aids. That's why I wanted to know. It makes a big difference whether you have to take care of someone who has four years left or someone who has one year left."

Quote 15. Patient 14 (77 years old) and Partner 14 (81 years old); Short prognosis

Patient 11: "You're also sick, but you don't have the idea yet of being so bad that within a short period of time you end up in such bad shape that all the muscles stop working. ... It's like it's so far from your daily life because you're still so healthy."

Quote 16. Patient 11 (56 years old); Short prognosis

Patient 9: "I had a brother who died [of ALS] within three-and-a-half months. … Fear absolutely, it's of course burying your head in the sand."

Partner 9: "The fear that it would be four months for you too. ... So on the one hand you were very afraid. … And when it was done, … you got a completely different result and that was a relief."

Quote 17. Patient 9 (55 years old) and Partner 9 (54 years old); Long prognosis

Patient 4: "I myself also cared for my mother with dementia and for a husband with Alzheimer's for 10 years. ... In the case of Alzheimer's, you have no idea how long it will last, and to what degree, and how it will all end. This is actually a pretty well-defined situation, clear cut, I would say. At a certain point it ends. Done. ... It doesn't have to take very long for me though."

Quote 18. Patient 4 (73 years old); Long prognosis

Information needs

Patient 8: "So I asked that rehabilitation physician 'let's hear it' [laughs]. Yeah! I was like, what do I have to lose? And that also came as a big shock to those around me, I think. ... I was mainly very curious about which of those five curves you can wind up in. And I was also a little curious to know why. I was raised in a very scientific way."

Quote 19. Patient 8 (52 years old); Long prognosis

Patient 2: "Seven years. Two more years after all. ... He also said that it's a slow variant. And so, with that my questions were basically answered [laughs]."

Quote 20. Patient 2 (57 years old); Very long prognosis

	Patient 1: "I would also like to have clarity to have a certain grasp on things. Every time I think, okay this is it, then we're already a step further. ... He's obsessive-compulsive [due to frontotemporal dementia] and I have to deal with it 24/7. So I would like clarity."
	Quote 21. Partner 1 (64 years old); Long prognosis
	Patient 13: "I don't really want to know how long I have left to live, but rather … how long I will be able to function as I function now. ... And that's a burning question: what will my life be like in a year's time? Statistically speaking, I'm still alive, but what will my quality of life be then?"
	Quote 22. Patient 13 (79 years old); Intermediate prognosis

3.2.3. Emotional Impact

The emotional impact of prognostic disclosure ranged from happy and reassuring to regret. Patients and caregivers said that good news about their personalized prognosis made them happy and gave them a feeling of having time and peace (quote 23 in Table 5) but emphasized that the communication style mediated the emotional impact (quotes 1, 2). A shorter than average prognosis could be a more difficult message to cope with for participants (quote patient 24) and one patient expressed regret over agreeing to discuss his personalized prognosis (quote 25). Many of the older patients, however, were more accepting, and some described the limited life expectancy as a relief (26, 18). Regardless of good or bad news, none of the patients said it caused them anxiety or to lose hope and most patients were satisfied with the discussion of their personalized prognosis.

Table 5. Patient and caregiver quotes on emotional impact & regaining control over the future.

Themes and Subthemes	**Quotes**
Emotional impact	
	Patient 4: "Three years seems like a very short time, but now you have a bit more space and that gives some room to breathe. It just gave us room to breathe." Daughter 4: "It does feel like we were given some time in a way." **Quote 23. Patient 4 (73 years old) and Daughter 4 (49 years old); Long prognosis**
	Patient 7: "If they have given me a diagnosis of 10 years, okay, that would have been nice. So this prognosis of three years, that makes it

extra difficult. Definitely. Also in the whole processing of it. ... Yes, it's a bit of [short pause] an emotional rollercoaster right now."

Quote 24. Patient 7 (57 years old); Intermediate prognosis

Patient 5: "[I was] a bit confused. So I went back to [the diagnosis day at the ALS Centre] where they had given three to four years. … How can she [rehabilitation physician] say two years? That's a difference of almost half! ... If I had known beforehand that the result would be so bad, I wouldn't even have started. Because I would rather live with the thought of three to four years than two."

Quote 25. Patient 5 (71 years old); Short prognosis

Patient 3: "Suppose I have another six months or so. Then we'll have been so good to each other, it must hurt a lot less to say goodbye. And it's easier for them [children], as well, not to see their mother deteriorate."

Quote 26. Patient 3 (69 years old); Short prognosis

Regaining control over the future

Helpful in looking towards the future

Patient 2: "It's just nice to know that I have some more time. You know, that does take away some of the uncertainty."

Quote 27. Patient 2 (57 years old); Very long prognosis

Partner 12: "I find that I get a lot of peace from that, that I know ... where I stand, where we stand as a family, and that we also have to make every day a celebration. Every day that [patient] is well, we have a party. Strange as it might be, we have no time left... So you just live a much more active lifestyle and you grab everything you can get your hands on … "

Patient 12: "Of course it [life expectancy] is a disappointment, but on the other hand it offers clarity. So you're going to have to get up more focused every day with that knowledge."

Quote 28. Patient 12 (57 years old) and partner 12 (47 years old); Short prognosis

Patient 7: "I have an appointment with the company doctor on Monday and I think I'm just going to say, 'y'know, with this life expectancy, I just want to stop working'. I just want to spend time regularly with the grandchildren and with my wife. ...If you know this [life expectancy], then of course you aren't completely in control, but you can start

	planning something. What I actually couldn't do before, when I had just been diagnosed."
	Quote 29. Patient 7 (59 years old); Intermediate prognosis
	Partner 12: "Both of us talk with social services in which [patient] talks up until death and I talk after the death ... that I shouldn't really be looking about afterwards, but rather that I should live more NOW, do things with [patient] now. And [patient] also gets advice to look further ahead, because that's where [the question] arises for me, because how am I going to support my children or our children when he's gone?"
	Quote 30. Partner 12 (47 years old); Short prognosis
Quality over quantity	Patient 8: "I especially hope that I will remain ambulant, that I can keep walking for example. And minimally to be able to use my hands even if they become weaker. … That means that I can mail, so I can communicate, voice my own wishes. For me that is fundamental to quality of life, that you are able to communicate your own wishes. … If that is not possible anymore, I think, life will end for me."
	Quote 31. Patient 8 (52 years old); Long prognosis
	Patient 3: "Suppose it were a year and a half. Then I think I would divide it into a year and six months and I think that the last six months is no longer acceptable to me. ... So my life expectancy is then one and a half years minus half a year, let's say. I'm just going to take charge of that myself. ... That does give me peace of mind."
	Quote 32. Patient 3 (69 years old); Short prognosis
	Patient 7: "It's not just life expectancy, it's also when you look at ALS: how it progresses. Then the quality of life, that deteriorates rapidly. ... And I'm really going to look into euthanasia. Because I really don't want to keep going until the very last moment. ... Look. I've resigned myself to the fact that it may be 3 years. Yeah, you hope that the quality of life will be good for a little while longer, or that it will be good for at least three years."
	Quote 33. Patient 7 (57 years old); Intermediate prognosis
	Partner 11: "The result is still between 18 to 30 months, then you hope for 30, that's the hope, yeah." Patient 11: "Yeah, you just hope that you can stay mobile and do things normally for as long as possible."

	Quote 34. Patient 11 (56 years old) and Partner 11 (54 years old); Short prognosis)

3.2.4. Regaining Control over the Future

Helpful in looking towards the future

The majority of patients and caregivers stated that discussing their personalized prognosis was helpful as it provided clarity and alleviated uncertainty (quotes 27, 28, 21). They told us how this information helped them regain some measure of control, enabling them to redefine and plan for the future (quotes 29, 10), including future care (quotes 11, 15), as well as what would happen after the patient's death (quote 30). Also, this knowledge helped participants make the most of the time they had left (quotes 28, 11).

Quality over quantity

Without being prompted to discuss the topic, the majority of patients, and some caregivers, emphasized the importance of quality of life over the quantity (quote 22). For them a good quality of life meant allowing them to engage in meaningful activities, to communicate with loved ones and friends, and to express their own will (quotes 31). A number of patients divided their remaining time into a "acceptable" part with a satisfactory quality of life and contrasted this with a "bad" part while reflecting on taking control over the end-of-life (quotes 31, 32, 33). Although a few patients and caregivers expressed the hope of being on the 'good side' of the prognosis, they hoped more often for a satisfactory quality of life for as long as possible (quotes 33, 34).

3.3. Physician focus group

Patient and caregiver themes described above were also recognized by the physician focus group (quotes p1–p9 in Table 6). Analysis of the focus group revealed potential benefits of discussing personalized prognosis and barriers.

Table 6. Quotes from physician focus group.

Themes and subthemes	**Quotes**
Tailored communication	
Communication style	"And I think it's very important HOW you discuss it with the patient, and that you feel how someone is receiving that message. Can someone accept that message, or are you just stirring up a lot of resistance? And if that's the case, how can you change your tone of voice or the way you present something so that it is well understood; so that the patient and the partner or close relative who is there can go along with it?" **Quote p1. Physician 2**

Information provision	"Of course, you always try in a conversation to get a clear idea in advance of the degree to which both parties wish to have the conversation. And what their expectations are and what thoughts they have about it. Yes and you know, you do try to reflect back those emotions that you notice or feel or see." **Quote p2. Physician 3**
	"But I also think it depends very much on how you tell people. If you just present that statistic not as fact and reality and truth, but just as very much the relativity of the statistic and that it does not come down to the month or the day." **Quote p3. Physician 1**
Coping style	"Yes, my patients were also fairly accepting of the news... But it is also perhaps a selection of the population that wants to know, let's say, because they already want to know. They're curious and they may already have an expectation of where they fall under." **Quote p4. Physician 5**
Personal factors	
Illness experiences	"So I've only discussed it twice and with both of them their reaction was actually 'well, that's the prognosis we were expecting'. So both of them weren't that shocked by the news." **Quote p5. Physician 4**
Information needs	"I also had a patient once who couldn't live with the fact that he didn't know [the personalized prognosis] ... The fact that he knew the model was there, for him, made him really want to know as well." **Quote p6. Physician 5**
Emotional impact	
	"With others, you notice a very emotional reaction they are really shocked by what the results of the prediction model are, and then there it is in writing in black and white or visible on the computer. And the picture you share with them then is often different from what they heard at [the diagnosis]." **Quote p7. Physician 2**
Regaining control over the future	
Helpful in looking towards the future	"And some patients say that they like to know where they stand so they can make a plan and think, I have more time or less time to plan my life further, and giving them something to hold on to." **Quote p8. Physician 2**
Quality over quantity	"I've also had people who actually found it very interesting, but then turned around and said 'but you still can't tell me how it's going to go'. So they actually found that much more interesting. ... Yes, that is much

	more relevant of course, so they already put the outcome and the conversation into perspective themselves." **Quote p9. Physician 1**
Potential benefits and barriers	
Benefits	"I think that also the way you present it and also if you include the patient in it, then it doesn't have to be more difficult than any other important subject, for example, discussing the limits of treatment... It's mainly about being able to talk to people about what their future looks like, even if it's shortened, and what they find important in the short time they have left. **Quote p10. Physician 2**
	"There have also been a few times when I thought, 'oh, this is worse than I thought', based on my clinical view." **Quote p11. Physician 2**
	"If you take the time, you are talking about things that actually affect the patient deeply.... And, that, I think is a very nice step towards very personal guidance. ... It can deepen your contact nicely, which is a nice basis for further conversations." **Quote p12. Physician 1**
Barriers	"The preparation takes more time ... [and] getting the concept right and explaining it well takes more time than getting the message across. And then it takes a lot of time to absorb the patient's reaction and interpret it correctly." **Quote p13. Physician 2**
	"Sometimes you really have doubts. I find, for example, in some patients, someone who has had cramps for five years or has had cramps all his life, has had cramps for four years and has had functional loss since December, explain to me when the symptoms started." **Quote p14. Physician 1**
	"ALS patients ... who either did not speak Dutch at all or where both patient and family only spoke English, I notice that I find this a complicated subject. ... That takes a lot of time … I don't get started with that. .... How I should and can discuss this clearly with non-native speakers, which also often involves a whole cultural problem." **Quote p15. Physician 2**

Benefits

Physicians agreed that discussing personalized prognosis is not that different from other difficult conversations about bad news in ALS (quote p10). The two more experienced physicians said that even with many years of experience, the prediction model provided valuable information because they were sometimes surprised by the outcome (quote

p11). Additionally, discussing personalized prognosis can enhance more personalized care (quote p12).

Barriers

Physicians underscored that preparation, interpreting the outcomes, especially in the case of missing (e.g., the outcome of genetic testing for C9orf repeat expansion) and uncertain data (e.g., date of symptom onset), requires time and effort, as does explaining the model, and responding to emotions (quote p13). They also discussed the dilemma of missing or unclear variables when filling out the model and how this can result in different outcomes (quote p14). Another topic that was discussed at length concerned the difficulty of prognostic disclosure with patients with a language barrier, which could be further confounded by a different cultural background (quote p15).

4. Discussion

This is the first study investigating experiences of patients, caregivers, and physicians when discussing personalized prognosis of survival based on a prediction model in neurological disease. Our study shows that personalized prognosis can be discussed with patients with ALS and their caregivers without negative impact, provided the physicians tailor communication to individual needs and preferences. Personalized prognosis may help patients and their caregivers regain control over the future, and can facilitate future planning, where maintaining quality of life is more important than survival time.

Most of the experiences of patients with ALS and their caregivers in our study are in agreement with studies on prognostic disclosure in other life-limiting diseases, and show that concerns about an adverse impact on psychological wellbeing of patients and caregivers are unwarranted (8,13,14). Indeed, studies show that an unfulfilled desire for a more personalized prognosis can cause frustration and distress for patients and caregivers (24,33,34), whereas patients and caregivers in our study reported that discussing personalized prognosis can alleviate uncertainty. Participants in our study differed in their information needs, some desiring a very detailed explanation of their personalized prognosis and prediction model and others wanting a more general indication of their life expectancy. All participants agreed about the importance of empathetic and honest communication. Our study and others show that exploring and tailoring prognostic disclosure to the emotional and information needs of patients and their caregivers mediates the emotional impact, supports acceptance, and improves satisfaction with the communication (14,18,24,27,35).

Prognostic disclosure may also promote acceptance and coping by supporting patients with life-limiting diseases and their caregivers to redefine and plan for their future, including future care, thus allowing them to focus on the present and their quality of life (30,35,36). Prognostic awareness also supports patients in planning future care together

with their caregivers and physicians, and allows for clinical and end-of-life decision-making that is better aligned with patients' values and preferences (7,18,24). This has been associated with a better quality of life, especially nearing end-of-life (37,38). In ALS specifically, this may help patients, caregivers, and ALS care teams to 'stay one step ahead' when planning future care and end-of-life (39). All of this can help patients regain a sense of control (29), especially relevant to patients with ALS who, from diagnosis, are confronted by the prospect of ever-present and increasing loss (33,40–42).

Coping style and illness experiences are important personal factors that mediate the acceptance and outcome of prognostic disclosure. Similar to our results, patients with advanced, incurable cancer preferring a more active coping style were more likely to want information about their prognosis and to use this in planning their future and future care (29). Additionally, older patients may find it easier to accept a poor prognosis, because they can reflect on a long, fulfilled life (29). Before discussing their personalized prognosis, many patients in our study already anticipated this on the basis of the changes they did or did not feel in their body. Living with a disease and experiencing symptoms may promote coping and acceptance, and limit the emotional impact of a poor prognosis (29). Some patients and caregivers in our study reported diverging prognostic information needs depending on their coping style and acceptance of the disease (29). A number of studies in ALS (43,44) and other life-limiting diseases (21,24) report that some caregivers may have a stronger desire for prognostic information than the patient. Our study suggests that, in addition to the need to plan future care and for the time after the patient's death, some caregivers may have a need for prognostic certainty, because they are not experiencing the rate of deterioration and cannot feel what the patient is feeling.

Physicians in our focus group agreed that, in many ways, discussing personalized prognosis is not so different from other bad news conversations. Communication guidelines (45,46) can support physicians in tailoring prognostic disclosure to individual patient needs. Discussion of prognosis itself takes little time but should be placed in the broader, holistic context of the patient's values and dignity, their perspective on the future, goals of care and treatment options, and quality of life.

Our results differ from those in other life-limiting diseases, in particular cancer, with respect to the relationship between prognosis and hope. Hope is acknowledged as essential in life-limiting disease and ranges from the hope to be cured, to having a longer life, a good life, to a good death. In cancer there is often a realistic hope for a cure and even in the palliative phase, cancer patients often hold out the hope of remission or a cure (28,47). When diagnosed with ALS, there is no prospect of a cure or remission, and patients are immediately referred to palliative care. As a result, shortly after diagnosis, most patients with ALS and their caregivers redefine their hope from hope of a cure to

focusing on hoping for a meaningful life (48). Patients in our study often focused more on the hope of maintaining a satisfactory quality of life rather than the quantity of time left.

While reflecting on their quality of life and remaining time, patients in our study also talked about taking control of the end-of-life through euthanasia. After receiving their diagnosis, most patients with ALS in the Netherlands inquire about the possibility of euthanasia (2). In other countries, many ALS patients consider hastening their death and would welcome the opportunity to discuss this topic with their physician; however, this often does not happen (49,50). Reasons to consider or actually hasten death include loss of autonomy and dignity, disability impairing quality of life, and a desire to control the end-of-life (50–52). Better prognostic awareness may support advance care planning and end-of-life decision-making, which can relief anxiety, provide a sense of control, support hope, and facilitate both quality of life and quality of dying when the disease becomes too much to bear (53).

The use of prediction models to predict survival and support decision-making is on the rise (10,12). Physicians in our focus group agreed that filling out the model, interpreting outcomes, and communicating estimated survival (and its uncertainty) in an easily understandable manner for patients takes some time, but after a small learning curve, it was no more difficult or stressful than other bad news conversations in ALS. The accuracy of a prediction model can be impaired by missing or unclear variables (54). The two most important predictors for the ENCALS prediction model and most at risk of uncertainty are date of onset and vital capacity (3). If these data are uncertain, physicians should consider the impact on the outcome and decide whether it is feasible to discuss the personalized prognosis. Physicians in our focus group were hesitant to discuss the personalized prognosis with patients with a language barrier and those from non-western cultures. However, non-western studies show a positive association between prognostic disclosure and quality of life; preferences about prognostic disclosure may differ among and within non-western cultures (55,56). It is recommended that physicians approach all patients, regardless of their cultural background, in the same way, by exploring their preferences and needs regarding this topic (45). The above-mentioned topics have already been incorporated in our communication guide (11).

This and other studies show that at least some patients with ALS and their caregivers would like to receive a more personalized prognosis than the average life expectancy of all patients (3,33,43,57). Some of the participants in our study took the initiative to ask their physician about the prediction model and their personalized prognosis after having read or heard about it. However, information discrepancy between the average life expectancy discussed at diagnosis and personalized prognosis may cause dissatisfaction and be detrimental to the patient-physician relationship (17). Proper discussion of personalized prognosis in the broader context of ALS care trajectory may not always be possible at

diagnosis due to time restraints and the shock of diagnosis-limiting information retention. However, besides discussing the fact that ALS is a lethal disease with a limited, but variable life expectancy, neurologists in the Netherlands should inform patients that they can be offered a more personalized prognosis at a later date, either in a second consultation with the neurologist or with the rehabilitation physician.

Finally, to facilitate uptake of discussing personalized prognosis in ALS, the online ENCALS prediction model could be made more user-friendly by integrating instructions to handle missing and unclear variables, and recommendations on how to discuss the outcome; also, the model should be validated in more populations.

4.1. Strengths and Limitations

An important strength of this study is the robust methodological design with two independent coders, and multiple viewpoints from patients, caregivers, and physicians. A possible limitation is that most participants had received a high level of education and none a lower level. We also lack the perspective of patients with a very short prognosis. However, due to their fast rate of disease progression, these patients are probably already aware of their poor prognosis and a personalized prognosis would offer very limited additional benefit.

5. Conclusions

Personalized prognosis can be discussed with patients with ALS who want information about their individual life expectancy, and with their caregivers, with minimal adverse emotional impact. For the emotional impact, how the message is communicated—i.e., a person-centered communication tailored to their emotional and information needs—is as important as what is communicated—i.e., a good or poor prognosis. Discussing personalized prognosis shortly after diagnosis may help patients with ALS and their caregivers regain control over the future and can facilitate planning (of the future) including future care. For many patients, quality of life matters more than quantity of time remaining.

Supplementary Materials

The following are available online at www.mdpi.com/xxx/s1 Table S1: COREQ checklist, Table S2: Researcher credentials, Table S3: Interview guide (with prompts) for interviews with patients and their caregivers on discussing personalized prognosis in amyotrophic lateral sclerosis, Table S4: Interview guide (with prompts) for focus group with physicians.

Author Contributions

Conceptualization, R.M.v.E., L.H.v.d.B., J.M.A.V.-M. and A.B.; Data curation, R.M.v.E., L.S.K.and W.J.K.; Formal analysis, R.M.v.E., L.S.K. and A.B.; Funding acquisition, L.H.v.d.B. and J.M.A.V.-M.; Investigation, R.M.v.E. and L.S.K.; Methodology, R.M.v.E., W.J.K.,

J.M.A.V.-M. and A.B.; Project administration, R.M.v.E. and A.B.; Resources, W.J.K., E.T.K.-v.R. and S.P.; Supervision, W.J.K. and J.M.A.V.-M.; Writing—original draft, R.M.v.E., L.S.K.and A.B.; Writing—review & editing, W.J.K., E.T.K.-v.R., M.A.v.E., L.H.v.d.B. and J.M.A.V.-M. All authors have read and agreed to the published version of the manuscript.

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Institutional Review Board Statement

The study protocol was submitted to the Medical Ethical Committee of the university medical center (UMC) Utrecht (18-870/C) who deemed it exempt from review as the Dutch Medical Research Involving Human Subjects Act was not applicable.

Informed Consent Statement: Participation was voluntary and written consent was obtained after informing patients and caregivers about the study.

Data Availability Statement

The data in this study, including the coding scheme, are available in Dutch on request from the corresponding author. The data are not publicly available due to privacy and ethical reasons.

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Conflicts of Interest

The authors report no disclosures relevant to the manuscript.

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Supplemental Material

Table S1. COREQ checklist.

Topic	Item No.	Guide questions/Description	Answer
Domain 1: Research team and reflexivity			
Personal characteristics			
Interviewer/facilitator	1	Which author/s conducted the interview or focus group?	See page 5.
Credentials	2	What were the researcher's credentials? E.g. PhD, MD	See Table S4.
Occupation	3	What was their occupation at the time of the study?	See Table S2.
Gender	4	Was the researcher male or female?	Not relevant for this study.
Experience and training	5	What experience or training did the researcher have?	See page 5.
Relationship with participants			
Relationship established	6	Was a relationship established prior to study commencement?	Participants were contacted by phone prior to the interview and informed about the study. The role of the interviewers was explained to participants. Other than that the interviewers were unknown to participants. See page 5.
Participant knowledge of the interviewer	7	What did the participants know about the researcher? e.g., personal goals, reasons for doing the research	No background knowledge of the interviewers was known to the participants, except for their role in the study. The background of the study was explained to participants. See page 5.

Interviewer characteristics	8	What characteristics were reported about the interviewer/facilitator? e.g., Bias, assumptions, reasons and interests in the research topic	Bothe interviewers were not involved in patient care. See page 5.
Domain 2: Study design			
Theoretical framework			
Methodological orientation and Theory	9	What methodological orientation was stated to underpin the study? e.g., grounded theory, discourse analysis, ethnography, phenomenology, content analysis	See page 4.
Participant selection			
Sampling	10	How were participants selected? e.g., purposive, convenience, consecutive, snowball	See page 4.
Method of approach	11	How were participants approached? e.g., face-to-face, telephone, mail, email	See page 4.
Sample size	12	How many participants were in the study?	See page 6 and Tables 1 and 2.
Non-participation	13	How many people refused to participate or dropped out? Reasons?	Two patients and one caregiver, who were invited by the physician to participate in this study and who agreed to participate, declined at a later time to participate. Both patients declined because they did not have sufficient time and energy to participate in the study; the caregiver did not give a reason for declining to participate.
Setting			

Setting of data collection	14	Where was the data collected? e.g., home, clinic, workplace	See Table 1.
Presence of nonparticipants	15	Was anyone else present besides the participants and researchers?	During the interviews no one else was present except for the participants and the interviewers.
Description of sample	*16*	What are the important characteristics of the sample? e.g., demographic data, date	See Tables 1 and 2.
Data collection			
Interview guide	17	Were questions, prompts, guides provided by the authors? Was it pilot tested?	The interview guide was not field tested. Topic guides have been included as supplemental tables (S3 and S4).
Repeat interviews	18	Were repeat interviews carried out? If yes, how many?	No repeat interviews were conducted.
Audio/visual recording	19	Did the research use audio or visual recording to collect the data?	Yes, see page 5.
Field notes	20	Were field notes made during and/or after the interview or focus group?	Field notes were made during the interviews to support the interviewer. These were not analysed or recorded after the interview.
Duration	21	What was the duration of the inter views or focus group?	See page 6.
Data saturation	22	Was data saturation discussed?	Yes, see page 5 and 6.
Transcripts returned	23	Were transcripts returned to participants for comment and/or corrected?	Yes, see page 5.
Domain 3: analysis and findings			
Data analysis			

Number of data coders	24	How many data coders coded the data?	Two, see pages 5 and 6.
Description of the coding tree	25	Did authors provide a description of the coding tree?	The coding tree is available (in Dutch) at request from the corresponding author.
Derivation of themes	26	Were themes identified in advance or derived from the data?	Derived from the data, see pages 5 and 6.
Software	27	What software, if applicable, was used to manage the data?	See page 5.
Participant checking	28	Did participants provide feedback on the findings?	No.
Reporting			
Quotations presented	29	Were participant quotations presented to illustrate the themes/findings? Was each quotation identified? e.g., participant number	Yes, see Tables 3–7.
Data and findings consistent	30	Was there consistency between the data presented and the findings?	Yes, see Tables 3–7 and Results section (pages 6–9).
Clarity of major themes	31	Were major themes clearly presented in the findings?	Yes, see pages 6–9.
Clarity of minor themes	32	Is there a description of diverse cases or discussion of minor themes?	Yes, see pages 6–9.

Table S2. Researcher credentials.

Name	Occupation
Remko M. van Eenennaam, MSc	Researcher (PhD-student)
Loulou S. Koppenol, MSc	Researcher (Master-student)
Willeke Kruithof, MD, PhD	Rehabilitation physician
Esther Kruitwagen-van Reenen, MD, PhD	Rehabilitation physician
Sotice Pieters, MD	Rehabilitation physician
Michael van Es, MD, PhD	Neurologist
Leonard H. van den Berg, MD, PhD	Neurologist
Anne Visser-Meily, MD, PhD	Rehabilitation physician
Anita Beelen, PhD	Senior researcher

Table S3. Interview Guide (with prompts) for Interviews with Patients and Their Caregivers on Discussing Personalized Prognosis in Amyotrophic Lateral Sclerosis

1. Can you tell me how the personalized prognosis was discussed with you?
    - Who took the initiative?
    - Were your information needs met?
    - Were your other needs met?
    - Was the prediction model discussed with you?
    - Were there differences between patient and caregiver experiences?
2. Can you tell me about the impact of discussing your prognosis?
    - Emotional impact;
    - Hope
    - Distress
    - Trust in physician
    - What is your life expectancy?
3. How satisfied are you with how your personalized prognosis was discussed with you?
4. What could be done to improve prognostic disclosure?

Table S4. Interview Guide (with Prompts) for focus group with physicians

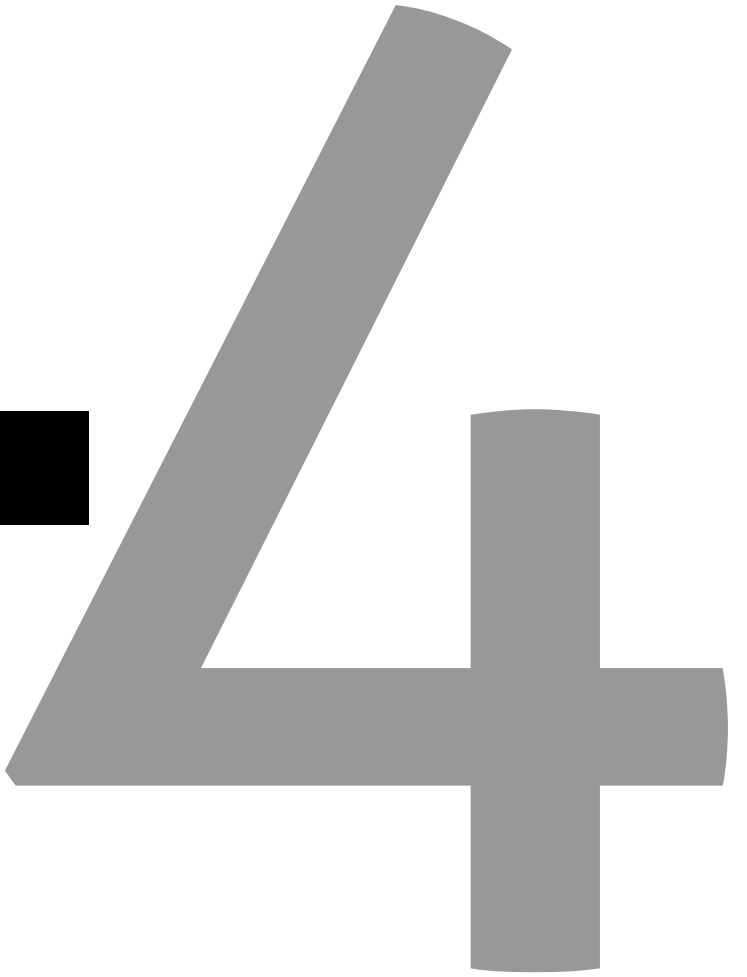
1. Do you always offer new patients the option to discuss their personalized prognosis?
    - Who takes the initiative?
    - How do you offer this to patients?
    - Why do patients want to know their personalized prognosis?
2. Do you experience discussion of personalized prognosis as more difficult or stressful compared to other topics?
    - Has your training prepared you sufficiently for prognostic disclosure?
    - Do you require more support?
3. What is the impact of prognostic disclosure on patients and their caregivers?
    - How do they react to their prognosis?
    - What are do's and don'ts when discussing the prognosis?
    - How do patients differ in their reaction?
    - Is there a difference between patients and caregivers?
    - Have you or the patients/caregivers returned to the topic during later consultations?
4. What are your experiences with the prediction model?
    - What are your experiences filling out the model?
    - What are your experiences with communicating the model and outcome to the patient/caregiver?

PART

2

Living with amyotrophic lateral sclerosis

CHAPTER



Telehealth as part of specialized ALS care: feasibility and user experiences with "ALS home-monitoring and coaching"

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Amyotrophic Lateral Sclerosis and Frontotemporal Degeneration, 2020

Abstract

Objective. To evaluate the use of telehealth as part of specialized care for patients with amyotrophic lateral sclerosis (ALS) and the user experiences of patients and healthcare professionals.

Methods. 50 patients with ALS were recruited from a single specialist centre and used telehealth, consisting of an ALS-app for self-monitoring and messaging, alerts for symptom-worsening, and nurse practitioner follow-up. Patients self-monitored their well-being (daily-report), body weight (weekly) and functional status (monthly). The use of the telehealth service was evaluated through adoption rate, dropout rate and adherence to self-monitoring. User-experiences were collected through online surveys among 23 patients and 9 healthcare professionals, and interviews with 12 patients.

Results. The adoption rate was 80%, dropout rate 4% and median follow-up was 11 months. Good adherence was seen in 49% of patients for well-being, 83% for body weight and 87% for functional assessment. For patients who discontinued using telehealth due to the end-of-life phase, median time between last measurement and death was 19 days. The majority of patients experienced using telehealth as easy, helpful, not burdensome , and reported satisfaction with flexible clinic visits and the continuity of care. Healthcare professionals reported that telehealth was of added value in ALS-care.

Conclusions. ALS-care supplemented by home-monitoring and nurse practitioner follow-up was shown to be suitable and widely accepted by patients and healthcare professionals in our ALS clinic. Success factors were low self-monitoring burden, a user-friendly platform and the provision of personalised feedback. Further research is needed to replicate these findings in other ALS clinics.

Introduction

A multidisciplinary specialist team approach in the management of Amyotrophic Lateral Sclerosis (ALS) is the gold standard of care, aimed at improving quality of life and survival through symptom management[1]. Currently, however, patients experience considerable barriers and burden related to multidisciplinary clinic (MDC) attendance, every three to four months. Travel barriers, such as long distances and limited mobility, and long exhausting clinic days due to seeing multiple healthcare professionals, have been reported as disadvantages of MDC attendance[2,3].

A possible solution for these issues is the use of telehealth. Telehealth has the potential to supplement in-person specialist care by allowing patients with ALS to be monitored and receive personalised advice and information in the comfort of their own home through telecommunication technologies. In contrast to in-person specialist care, access to telehealth is independent of patients' ability to travel or distance from a MDC. In addition, telehealth facilitates remote monitoring of patients between clinic visits, which is currently lacking in ALS care. The remote monitoring of disease progression could help the multidisciplinary care team to tailor care and information to the ever-changing needs of patients with ALS.

In co-creation with patients, caregivers, healthcare professionals, managers and information technologists, we developed the telehealth service *ALS Home-monitoring and Coaching*. A pilot study (*N*=10) in 2016 confirmed its feasibility[4]. On 1st May 2017, the telehealth service was implemented in specialist care at the ALS clinic of the University Medical Centre Utrecht, the Netherlands, where patients with motor neuron disease receive multidisciplinary care. The telehealth service has been used for over 18 months and patients with ALS were invited to use it as part of their care.

The aim of this study is to evaluate the use of *ALS Home-monitoring and Coaching* in specialist ALS care, and the user experiences from the perspectives of patients and healthcare professionals.

Materials and methods

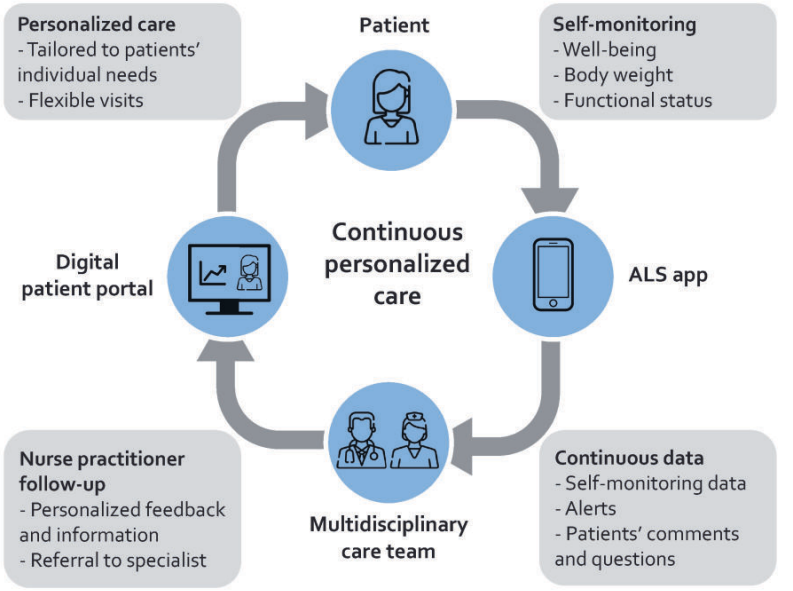
Study Design, Setting and Population

This prospective single centre cohort study was performed at the specialized ALS clinic in Utrecht. The catchment area was the province of Utrecht, with a maximum travel distance of 50km. All patients with ALS who received multidisciplinary care at the ALS clinic between May 2017 and November 2018 were eligible for inclusion. During a regular visit to the multidisciplinary clinic, a rehabilitation physician invited patients to use telehealth. Patients who participated were followed-up until 28th November 2018.

The telehealth service

The design process of *ALS Home-monitoring and Coaching* was inspired by the user-centered design approach which aims to truly meet the needs of end-users (patients and healthcare professionals)[5]. Involving patients in the development process resulted in the design of an appropriate self-monitoring protocol and a user-friendly telehealth service. In order to standardise remote monitoring, a protocol was developed based on ALS guidelines and expert opinion from members of the multidisciplinary care team. The protocol specified what information and feedback should be provided to the patient in response to changes in functioning. It also specified the timing of referral to the multidisciplinary care team and what topics the nurse practitioner should discuss with members of the team. The key features of *ALS Home-monitoring and Coaching* were: 1) App-based self-monitoring, 2) a message function, 3) alerts and 4) follow-up by a nurse practitioner. An overview of the key features can be found in Figure 1.

Figure 1. The continuous personalized care design of ALS Home-monitoring and Coaching



App-based self-monitoring

The ALS app (by Focuscura, The Netherlands) was operational on a smartphone, tablet and personal computer. Patients were offered a tablet when they had no electronic device compatible with the ALS app. When patients had upper limb impairment, (informal) caregivers assisted with operating the smartphone/tablet and self-monitoring. Patients were able to use eye-control when using a computer for self-monitoring. During an

introductory interview, the nurse practitioner created an account for patients and helped them install the ALS app. Patients used the ALS app to self-monitor their health status, through the assessment of well-being, body weight and functional status. Well-being was assessed by answering the question 'How are you today?' with a score from 1 to 10. Additionally, patients were invited to comment on their score and well-being in the ALS app through a free-text entry. Body weight was assessed with a regular or Bluetooth body weight scale. All patients were offered a Bluetooth scale, but patients were allowed to use their own scale. The Bluetooth scale transmitted the body weight data automatically to the ALS app, while patients with a regular scale had to enter the data manually. Functional status was assessed with a self-administration version of the revised ALS functional rating scale (ALSFRS-R).[6] The default self-monitoring frequencies were daily for well-being, weekly for body weight and monthly for functional status. At the start of monitoring, frequencies were set at default, but could be adjusted to patients' preference. To remind patients about self-monitoring, a notification was automatically sent by email at an agreed-upon time and day of the week. Patients had open access to their own data, which was accessible in the ALS app. Once a measurement had been completed, the data were transmitted automatically to a central server, also accessible to healthcare professionals. Additionally, the ALS app was integrated in the electronic health records, which facilitated data accessibility for the multidisciplinary care team.

Message function

The ALS app included a free-text message function, which allowed for patients to comment on or ask questions about any topic including: symptoms, treatments, aids, personal issues, technical issues or consultation planning. Depending on the question or comment, the nurse practitioner answered the questions and gave advice within three days, and if needed referred patients to the multidisciplinary care team. Patients were informed about a possible delay in the reply and in case of urgency they were told to contact their general practitioner

Alerts

Alerts signalled the nurse practitioner when a significant change in health status occurred involving a drop to (or below) a pre-determined threshold. Alerts were generated when 1) body weight had decreased by 5% and 10% of premorbid weight, 2) the well-being question was answered with a score of two or lower and 3) any item score of the ALSFRS-R dropped one point or more relative to the last measurement. The nurse practitioner monitored the individual alerts and trends of all patients and discussed the changes in health status weekly with the multidisciplinary care team.

Monthly follow-up by nurse practitioner

In addition to the follow-up on patient's messages, the nurse practitioner, who was engaged with all patients, evaluated their individual health status data and provided monthly personalised feedback and information via an e-consult or telephone consultation. Patients could access the e-consult in their electronic medical record, through a web portal login with two factor authentication (digital identification: the online ID allowing access to services and government websites in the Netherlands, with username, password and short message service (SMS) verification). The nurse practitioner was supervised by a rehabilitation physician and used the standardised monitoring protocol to ensure adequate personalised feedback and information for all patients. If necessary, patients were referred by the nurse practitioner to members of the multidisciplinary care team for a face-to-face consultation.

Outcome measures for the use of the ALS app

The use of the ALS app was evaluated through the adoption rate, adherence, and dropout. Adoption rate was calculated as the proportion of patients who chose to adopt telehealth. Adherence was defined as the percentage of completed self-monitoring assessments agreed upon. Adherence was calculated for patients who had activated their account for ≥1 month for well-being and body weight, and for ≥2 months for functional status. The dropout was defined as the number of patients who discontinued telehealth due to reasons unrelated to the end-of-life phase or death.

User-experience assessment

Surveys

Patients.

Patients whose account was activated for over four months were invited to fill in a one-time online survey designed for the purpose of the study. Patients received an email with a link to the survey that was accessible on a secure survey website (Collector 2015.Q2). Data were stored on the web-server of the website. The survey evaluated user experiences, such as ease of use, perceived burden, and perceived benefits. Patients were asked to respond to a number of statements and questions on a 5-point Likert scale. Scores of 4 or higher were coded as being in agreement.

Healthcare professionals.

A one-time online survey was administered to all members of the multidisciplinary care team at the UMCU. Healthcare professionals received an email with a link to the survey that was accessible on a secure survey website (Collector 2015.Q2). The survey evaluated the extent to which the self-monitoring data were used by the healthcare professionals and whether the use of telehealth led to changes in care.

Semi-structured interviews

Semi-structured interviews were conducted by two of the investigators (JH, RvE) to further explore opinions and experiences of patients regarding the use of telehealth. Consecutive patients who completed the survey were selected. The interviews were discontinued when data saturation was reached.

Analysis

Two groups of patients were distinguished: prevalent and incident patients. Prevalent patients included those who were diagnosed and received multidisciplinary care at the ALS clinic before the implementation of telehealth on 1st May 2017 (including patients who participated in the pilot). The prevalent group was a convenience sample, as these patients were selected by the rehabilitation physician based on health status, disease progression and potential benefits of telehealth use. Incident patients included all consecutive patients who were diagnosed and started to receive multidisciplinary care at the ALS clinic after the implementation of telehealth. In order to avoid selection bias, the adoption rate was only calculated for the sub-group of incident patients.

Self-monitoring adherence was calculated for all patients and reported as the percentage of patients that showed good adherence. The adherence of an assessment was judged as good when patients completed ≥50% of agreed-upon measurements for well-being and body weight and ≥75% for functional status. A minimal adherence of 50% was considered to be sufficient for patients to reflect on their well-being and for healthcare professionals to observe a trend in body weight between clinic visits. Body weight adherence was calculated until patients were unable to weigh themselves due to the inability to stand (ALSFRS-R item 8 score=0). A minimal adherence of 75% for the assessment of functional status was required, as the ALSFRS-R was only measured once per month and the provision of tailored feedback and information was mainly based on ALSFRS-R scores.

The survey results were reported as the number and percentage of subjects who (totally) agreed to a statement. Data from the structured interviews were digitally recorded and transcribed verbatim. The interviews were coded by two independent researchers. Thematic analysis was performed until data saturation was reached and no more themes emerged.[7]

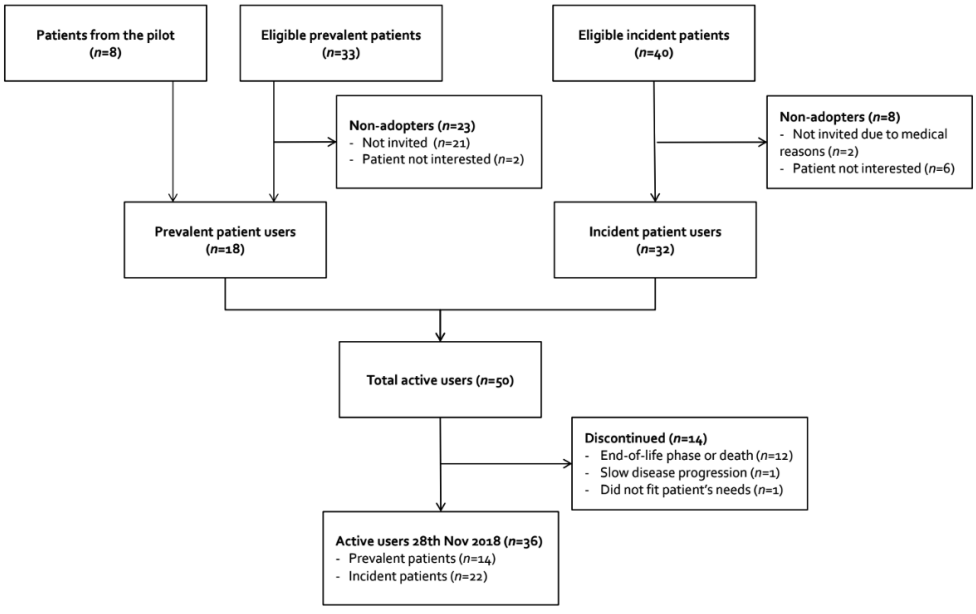
Results

In the period 1st May 2017 to 28th November 2018, a total of 50 patients used *ALS Home-monitoring and Coaching*, consisting of 18 prevalent and 32 incident patients. The inclusion flowchart can be found in figure 2. A total of 41 prevalent patients received care before the implementation of the telehealth service, 8 of which were already enrolled in the pilot, 21 of which were not invited (reasons not documented), 12 were invited of

which 10 adopted telehealth. 40 newly diagnosed incident patients were referred to the multidisciplinary care team and were invited to use telehealth between May 2017 and November 2018; of these 32 (80%) adopted telehealth. A total of 14 patients discontinued using telehealth in the follow-up period. The most frequently reported reason for discontinuing telehealth was no added benefit from telehealth due to the end-of-life phase or death (*n*=12). For patients who discontinued telehealth in the end-of-life phase, median time between the final measurement and death was 19.0 days (IQR=7.8-49.0). There were two dropouts in this study. Reasons for dropping out were no perceived use due to slow disease progression (*n*=1) and telehealth did not fit patient's needs (*n*=1).

Patients were, on average, 61 years old at diagnosis, mostly male (64%), diagnosed with ALS (76%), and had spinal onset (72%). See table 1 for an overview of all patient characteristics. 4 patients had an electronic device that was not compatible with the ALS app and therefore received a tablet for self-monitoring, all other patients had compatible devices. 6 patients received a Bluetooth scale, all other patients preferred using their own scale. Patients were followed-up for a median of 10.8 months (IQR=5.9-13.2)(Figure 3).

Figure 2. Flowchart of users of ALS Home-monitoring and Coaching



Characteristic	All patients (N=50)	N	Prevalent patients (N=18)	N	Incident patients (N=32)	N
Gender, male *n(%)*	**32 (64,0)**	50	11 (61.1)	18	21 (65.6)	32
Age (years), *mean(SD)*	**61.4 (13.0)**	50	56.3 (15.1)	18	64.2 (11.0)	32
Level of education[a], *n(%)*		34		16		18
Low	**16 (47.1)**		9 (56.3)		7 (38.9)	
High	**18 (52.9)**		7 (43.8)		11 (61.1)	
Diagnosis, *n(%)*		50		18		32
ALS	**38 (76.0)**		11 (61.1)		27 (84.4)	
PMA	**12 (24.0)**		7 (38.9)		5 (15.6)	
Site of onset, *n(%)*		46		17		29
Bulbar	**13 (28.3)**		3 (17.6)		10 (34.5)	
Spinal	**33 (71.7)**		14 (82.4)		19 (65.5)	
ALSFRS-R at diagnosis, *mean(SD)*	**42.0 (3.7)**	43	42.9 (2.6)	14	41.6 (4.1)	29
ALSFRS-R at start monitoring, *mean(SD)*	**38.3 (8.1)**	48	33.8 (9.1)	18	41.0 (6.1)	30
Time between diagnosis and start monitoring (months), *median(IQR)*	**2.4 (1.4-14.3)**	48	19.7 (10.6-44.5)	18	1.6 (1.3-2.4)	30

Table 1 Patient characteristics [a]Level of education was classified as low (none, grade school, high school and technical or trade school) and high (University degree or Graduate school). ALSFRS-R = ALS Functional Rating Scale Revised. SD = Standard deviation. IQR = interquartile range.

Adherence and user-data

Good adherence was seen in 49% of patients for the assessment of well-being, in 83% for the assessment of body weight and in 87% for the assessment of functional status. A total of 2003 messages were sent to the nurse practitioner via the ALS app by 47 patients (M=42.6, range=3-268). Most of the messages were comments explaining the given well-being score. 241 well-being alerts were generated in 17 patients (M=14.2, range=1-44),

395 body weight alerts were generated in 31 patients (M=12.7, range=1-39) and 263 functional status alerts were generated in 47 patients (M=5.6, range=1-14).

User-experiences

Patient survey

In total 23 out of 34 patients who were invited, completed the survey (response rate 68%); 17 of whom were men and with an average age of 63.2 years. Patients completed the survey after using telehealth for a median duration of 5.8 months (IQR=4.7-10.9). The majority of patients were positive about receiving personalised feedback and information, and perceived the use of telehealth as helpful, easy and not burdensome. All but one patient would recommend the use of *ALS Home-monitoring and Coaching* to others. Patients had mixed opinions on the ease of logging onto their electronic medical record with their digital ID to access the monthly feedback through the e-consult. All patient survey results can be found in Table 2.

Healthcare professional survey

The healthcare professional survey was administered 18 months after the implementation of telehealth and was completed by 9 of 11 (82%) healthcare professionals of the multidisciplinary care team (two rehabilitation physicians, two occupational therapists, two physical therapists, a speech therapist, a dietician and a social worker). The survey showed that the majority of healthcare professionals used the monitored data to prepare for consultations (Table 3). Healthcare professionals reported that they had consultations as a result of referral by the nurse practitioner.

Workload was similar compared to care without telehealth for most healthcare professionals, but in-person consultations were used more effectively, as the available monitoring data helped them in preparing the consultation . Furthermore, all healthcare professionals reported that the use of telehealth was of added value in ALS care and that they would recommend it to other healthcare professionals.

Survey item	n (%)	Total (N=23)
I experience the use of telehealth as easy.	19 (83)	23
I experience the use of telehealth as burdensome.	3 (13)	23
I experience the use of telehealth as time consuming.	2 (9)	23
I experience the use of telehealth as helpful in care.	19 (83)	23
I succeeded in logging onto my electronic patient record and reading the personal feedback and information in the e-consult.	20 (87)	23
I experience logging onto the electronic patient record as easy.	11 (55)	20
I experience receiving information through the electronic patient record as positive.	18 (90)	20
I experience receiving personalized feedback as positive.	19 (95)	20
Inserting and seeing data about how I am functioning was a positive experience.	17 (74)	23
I experience more control over care.	20 (87)	23
Telehealth helps me to make decisions about care.	13 (59)	22
I believe that care with telehealth is better than care without it.	18 (82)	22
I intend to keep using telehealth.	22 (96)	23
I would recommend telehealth to other patients.	22 (96)	23

Table 2 Patient survey results

Survey question	Responses		
	Regularly	Sometimes	(Almost) never
How often do you use the well-being data to prepare for consultations?	4/9	3/9	2/9
How often do you use the body weight data to prepare for consultations?	6/9	0/9	3/9
How often do you use the functional status data to prepare for consultations?	6/9	1/9	2/9
How often do you have a consultation due to a referral by the nurse practitioner?	7/9	2/9	0/9
Survey statement	Responses		
	(Totally) agree	Neutral	(Totally) disagree
The use of telehealth reduces the workload of healthcare professionals.	2/9	5/9	2/9
Telehealth is of added value to usual ALS care.	9/9	0/9	0/9
I would recommend the use of telehealth to other healthcare professionals.	9/9	0/9	0/9

Table 3 Healthcare professional survey results.

Structured patient interviews

The interviews showed negative as well as positive experiences. Themes related to negative experiences were log on issues and being confronted by decreasing ALSFRS-R scores. Themes related to positive experiences were the user-friendliness of the ALS app, the low burden of the self-monitoring protocol, better understanding of the disease, increased perceived control over care, greater continuity of care and reassurance, more flexible consultations and moments for self-reflection. Identified themes are presented in Table 4.

Topic	Theme	Description	Quotes
Negative experiences	Log-in issues	Some of the patients experienced logging into the electronic patient record with their digital ID as a barrier for reading the feedback in their e-consultations. Most patients, however, did not perceive this as a barrier.	*"A hassle with the digital ID, it takes four steps before you find out what it's about."* Patient 2 *"Logging in is difficult with the digital ID."* Patient 10
	Confronting experiences	Self-monitoring of health status and specifically the functional status assessment, was experienced as confronting by some of the patients in the early disease stages. This was due to the answer options of the ALSFRS-R showing the worsening of the disease yet to come. However, over time patients got used to the idea and no longer experienced it as confronting. Furthermore, patients generally had no interest in the graphs and the decline their data showed.	*"At the start it was a bit confrontational. You see things and think: 'is that what is going to happen?'. On the other hand, you get used to it the more often you do it."* Patient 1 *"It is like a falling stock market, you are simply not happy about it. I understand that it is great for science, but it is useless for the patient."* Patient 6
Positive experiences	User-friendliness	In general patients were very satisfied with the ALS app, because it was easy to use and worked	*"Very user-friendly. Nothing to comment on. Graphs look clean, well laid out."* Patient 1

		well. Some patients did have some minor technical complaints (notifications did not repeat, app-screen did not rotate with phone).	
	Low burden	The majority of patients reported that self-monitoring cost very little time and was not burdensome. Patients felt that they got much more in return compared to the amount of time and effort that was required.	*"It is so easy… a daily routine. More of a burden, but you get more in return. On balance, the end result is always positive; despite requiring something from me, I have the feeling that I get a lot more out of it than if I did not do it."* Patient 1
	Self-reflection	A benefit of self-monitoring reported by patients was that it helped them reflect on their mood and feelings.	*"The greatest advantage is that you become aware of how you are doing, and that's good. When I am aware that I am feeling really good or even slightly worse, those are the moments I use the app."* Patient 2 *"Actually choosing a fixed moment of the day to reflect on that day. How am I feeling and why? Because you don't always know what the cause is and this makes you think about it. A moment of reflection."* Patient 12

	Increased perceived control	Patients experienced more control over their healthcare due to telehealth. Patients reported that the use of telehealth facilitated communication with the ALS care team, which helped them to better indicate which topics they wanted to discuss or focus on.	*"I think that by monitoring myself, I am able to give others more information to make decisions about me. I am in control and can enable others to observe me better."* Patient 1 *"It is an easy way for me to pass things on to the physician. I tell them what the problem is and the hospital indicates what is useful. So I am in control without having to possess the knowledge. I just want advice. This makes it more problem-driven and up-to-date. And I like that."* Patient 10
	Continuity of care/ reassurance	At home, patients experienced the feeling of being monitored continuously by the ALS care team in between visits, which felt personal and reassuring. Patients also found it a comforting thought to know that the ALS care team would intervene when the disease would worsen.	*"You really have the feeling that there is continuous interaction, that someone is keeping an eye on you. You are no longer counting the days from one consultation to another."* Patient 2 *"That's what I find ideal. We will not be going again in three months' time, because if the app shows in a month that I am not doing well, the hospital takes the initiative. I have experienced this and I like it. This means I do not*

			have to wonder 'should I call the physician?', because if the physician is worried they will call me. Now that's what I call service." Patient 10 *"I notice that the measurements are being read and that the care team knows how I am doing from day to day."* Patient 11
	Flexible consultations	Continuous monitoring allowed for more flexible consultations, which patients were highly satisfied about. Patients liked that it reduced the amount of unnecessary visits and travel burden.	*"My last appointment was 6 months ago, i.e. the routine visit. I find that smart, because if it is not necessary, then it is not necessary."* Patient 1 *"For now we have agreed with the physician not to plan a new appointment but to do that on the basis of the app. If no tests are necessary, there is no point, it is only an extra burden."* Patient 7 *"You don't feel you are going for no good reason. You have some control over that."* Patient 12

Table 4 Overview of themes regarding patients' experiences with telehealth, supported by quotes.

Discussion

This study showed that the use of home-monitoring and nurse practitioner follow-up was suitable for the provision of multidisciplinary ALS care, with a high adoption rate, good adherence, few dropouts and positive experiences from patients and healthcare professionals. This is the first study to report on the use of an implemented app-based telehealth service with self-monitoring in specialized ALS care.

The majority of newly diagnosed patients in the current study adopted telehealth, showing that patients with ALS were willing to use technology in their care. Previous research has shown that patients with ALS are generally familiar with using technology.[8–11] Patients who did not adopt telehealth were, on average, older and the majority were female.

Patients showed good overall adherence to the self-monitoring protocol. Facilitators of self-monitoring adherence in the current study were a user-friendly app, low burden of self-monitoring and use of notifications. These factors have also been identified as facilitators of self-monitoring in previous literature.[12] Another facilitator of adherence was the provision of monthly personalised feedback on the self-monitoring data.[12] This likely motivated patients to adhere to the self-monitoring protocol. Furthermore, most healthcare professionals used the monitored data during regular in-clinic consultations. Other factors that motivated patients were a feeling of control they gained through self-monitoring, as well as more flexible clinic visits tailored to their needs. A barrier to telehealth use was difficulty accessing the e-consult. Providing personalised feedback in the ALS app could facilitate accessibility in the future.

In contrast to the current study, Paneroni et al. [13] reported low adherence to a self-monitoring protocol. This was likely a result of the complexity of reporting and the high number of daily assessments in this study. In two other studies good adherence with (bi-)weekly home-based self-monitoring was observed.[14,15] Accordingly, patients reported that technology was user-friendly and self-monitoring was easy.[15,16]

Although we found good overall adherence in the current study, it was noticeable that adherence to the well-being assessment was low compared to the adherence to the bodyweight and functional status assessments. Low adherence was likely due to the fact that the default frequency with daily assessments was too high for some of the patients. For this reason, self-monitoring frequencies were lowered at individual patients' request. The requested changes in frequency were, however, not taken into account in the calculation of adherence as these were not documented in the ALS app. The missing information resulted in an underestimation of adherence. Despite the lower adherence of the well-being assessment, 85% of patients completed the well-being assessment at least

once per week. This was found to be sufficient for the provision of psychological support and for patients to self-reflect on their well-being.

A remarkable finding was that patients continued to use the ALS app to contact the ALS clinic and read the personal feedback from the nurse practitioner until shortly before their death. These findings suggest that patients valued communication with the nurse practitioner in the end-of-life phase, despite the fact that care in the end-of-life phase is on the whole provided by a general practitioner. Accordingly, the interviews showed that patients experienced more continuity of care and a feeling of reassurance as a result of remote monitoring by the nurse practitioner.

An important aspect of remote monitoring was alerts for disease worsening, which were found to be appropriate for the provision of feedback and information in most cases. However, for the well-being assessment repetitive alerts were seen in two patients who gave low scores consecutively. These patients were called by the nurse practitioner and received psychological support. Repetitive alerts were also generated in some patients for the body weight assessment, as these patients remained stable in body weight below the cut-off value. The nurse practitioner did not perceive these repetitive alerts as a burden. The alerts that were generated for every drop of the ALSFRS-R score were found to be abundant, as the nurse practitioner would provide monthly feedback three days after patients completed the ALSFRS-R, regardless of any changes in score. For this reason, we have removed all alerts for the functional status assessment.

So far, previous research on the use of telehealth in ALS has reported on home-based self-monitoring, videoconferencing, the store and forward method, and remote monitoring of non-invasive ventilation.[17] A parallel publication reported on the use of a telehealth system similar to *ALS Home-monitoring and Coaching,* which also included a patient app for self-monitoring, a clinical portal, alerts and a telehealth nurse.[15,18] In this trial patients and caregivers reported that telehealth was easy to use, self-monitoring did not cost a lot of time and they would recommend telehealth to others. These findings are similar to the results of the current study, and support that app-based self-monitoring is a suitable method for providing remote care to patients with ALS.

Currently, the platform costs associated with the telehealth service are funded by the University Medical Centre Utrecht as there is no reimbursement for this type of telehealth. The lack of reimbursement is the main barrier to widespread implementation and use of telehealth. In order to facilitate the future implementation and use of telehealth, healthcare insurance companies should include telehealth in their reimbursement options.

Limitations

The current study was conducted in a single specialized centre, which limits the generalizability of the results and the transferability to other settings. We are, however, working on the nationwide implementation of *ALS Home-monitoring and Coaching*, which will allow us to evaluate its feasibility in other healthcare settings and generalize future findings. The results obtained from the prevalent patients may suffer from selection bias, as this was a convenience sample. Furthermore the response rate of the patient survey was relatively low, which could mean the results of the survey may have a risk-of-bias. A methodological and technical limitation was that requested changes in self-monitoring frequency were not documented in the ALS app software. As a result, the missing data lead to an underestimation of adherence. In the current study we chose to exclude the assessment of caregiver user-experiences. However, caregivers play an important role in assisting patients with the use of telehealth, for this reason this is an interesting topic for future research. Future studies should also investigate the cost-effectiveness of *ALS Home-monitoring and Coaching,* its feasibility in other healthcare settings, and the effect of personalised care on the timing of therapies and assistive devices.

Conclusion

In conclusion, we have shown that ALS care supplemented by app-based self-monitoring and nurse practitioner follow-up was suitable and widely accepted by patients and healthcare professionals. Success factors of the telehealth service were low self-monitoring burden, a user-friendly platform and the provision of personalised feedback. A potential barrier for widespread implementation of this telehealth service, is the lack of reimbursement. Future research should investigate the cost-effectiveness and the feasibility of this telehealth service in other healthcare settings.

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Declaration of interest

The authors declare no conflicts of interest and that the current study is their own work.

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CHAPTER

5

Current practices and barriers in gastrostomy indication in amyotrophic lateral sclerosis: a survey of ALS care teams in the Netherlands

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Abstract

Objective To describe current practices and barriers and support needs in gastrostomy indication and decision-making amongst rehabilitation physicians of ALS care teams in the Netherlands.

Methods Cross-sectional online survey of rehabilitation physicians of ALS care teams in the Netherlands. Survey items covered current practices in *timing of indication* (i.e. indicators and criteria), *goals*, *initiating discussion about gastrostomy*, and criteria for preferred *method of placement*; and *barriers* and *support needs* in indication and decision-making. Descriptive analysis was used for quantitative responses, thematic and content analysis for qualitative data.

Results 29 physicians (41%) of 27 ALS care teams (71%) responded. *Timing of indication:* physicians agreed on important indicators but not cutoff values/criteria. *Goals:* optimizing nutritional status (100%), ensuring safe food-intake (72%), and reducing effort of meals (59%). *Initiating discussion about gastrostomy:* 52% introduces the topic early after diagnosis, 48% at indication. Criteria for *method of placement* included physician preference (69%), availability of service (21%), lower complication risk (17%), contraindication (59%), and patient preference (24%). Reported *barriers* (69% of respondents) were: patient readiness (52%), timing of indication (31%), and organizational barriers (18%). *Support needs* (62%): evidence-based timing of indication (35%) and tailored patient education (31%).

Conclusions There is practice variation in timing of first introduction of gastrostomy and preferred method of placement, but agreement on goals and indicators. More evidence on optimal timing of gastrostomy placement is needed. However, until then early and regular discussion of the topic of gastrostomy and better patient information may promote patient readiness and support patient choice.

Introduction

Patients with Amyotrophic lateral sclerosis (ALS) often experience poor nutritional status and weight loss due to loss of muscle mass and a reduction in body fat mass, which is undesirable as these are independent prognostic factors for survival (1). The etiology of weight loss in ALS is complex and multifactorial and includes increasing problems with chewing and swallowing, and the ability to bring food to the mouth due to reduced upper limb function (2). Prolonged, effortful meals can also negatively influence quality of life and cause distress to patients and their caregivers (3). ALS guidelines recommend to consider gastrostomy to support patients with ALS to meet their nutritional requirements (4–8). However, healthcare professionals find the timing of indication, discussion with the patient, and placement of gastrostomy difficult and challenging (9).

A uniform approach to placement of gastrostomy is complicated by heterogeneous speed of disease progression and difference in clinical presentation (10). There is a lack of conclusive evidence on effectiveness of gastrostomy in promoting survival, weight, and quality of life (11–15). Additionally, clear cutoff values for dysphagia, weight loss, and respiratory impairment to support optimal timing of gastrostomy placement are also largely absent (2,11). This is reflected in the Dutch and international ALS guidelines which offer limited help with regard to optimal timing of gastrostomy indication (4–8). The two most commonly used methods of gastrostomy in ALS are percutaneous endoscopic gastrostomy (PEG), which has long been the golden standard and most commonly used method, and percutaneous radiological gastrostomy (PRG), also known as radiologically inserted gastrostomy. Studies show no difference between PEG and PRG in the effect on survival or weight stabilization (11,13,16) and both come with advantages and drawbacks (4,17). Finally, a lack of patient readiness, i.e. the inability or unwillingness to make a decision, can also complicate the decision-making process (18,19). Uncertainty on optimal timing and method of placement, and complexity of the decision-making process may lead to practice variation.

In the Netherlands 38 multidisciplinary ALS care teams coordinated by rehabilitation physicians are responsible for the care of patients with ALS. It is unclear what current practices with regard to gastrostomy are in ALS care teams. In order to improve the clinical pathway, information provision, and decision-making on gastrostomy, we investigated 1) current practices in timing of indication, goals, initiating discussion about gastrostomy, and method of placement (PEG or PRG) in gastrostomy amongst rehabilitation physicians of ALS care teams in the Netherlands, and 2) barriers and support needs in the indication and decision-making process.

Method

Setting

In the Netherlands, care for patients diagnosed with ALS is covered by 38 multidisciplinary ALS care teams associated with a the ALS Care Network. The ALS Care Network is a nation-wide healthcare network aimed at providing optimal care for people with ALS in the Netherlands. The ALS care teams vary in number of patients and organizational structure, but also in setting from small regional hospitals, large university medical centers, to rehabilitation centers. Care in these teams is multidisciplinary and coordinated by a rehabilitation physician.

Design and participants

We conducted a cross-sectional online survey on gastrostomy indication and decision-making in ALS amongst rehabilitation physicians of ALS care teams in the Netherlands. A total of 71 rehabilitation physicians of 38 ALS care teams were identified through the registry of the ALS Centre Netherlands; rehabilitation physicians were informed about the study and invited to participate via email. After two months a reminder was sent out to all physicians who had not yet completed the survey. Physicians' anonymity was ensured by using codes instead of names.

Survey

The online survey was developed using Castor's Electronic Data Capture software (www.castoredc.com). The topics of the survey were based on literature and expert opinion of rehabilitation physicians (WK, EK, AV) of our ALS care team at UMC Utrecht, the Netherlands. All items were a combination of multiple choice, dichotomous, and open questions. The survey started with questions on years of experience in ALS, the number of patients currently in care and the number of those with gastrostomy (PEG, PRG, or other) or nasogastric tube.

1. Current practices regarding gastrostomy

To determine current practices regarding gastrostomy in the Netherlands we asked participants to answer items on four topics. *Timing of indication*: clinical indicators (malnutrition/weight loss, dysphagia, sufficient intake of liquids, vital capacity (VC), prolonged and difficult meals, decreased appetite, dependency on others, hypermetabolism, recurrent chest infections due to aspiration, oral hygiene) and criteria/cutoff values for these indicators; guidelines used in coming to a gastrostomy indication. Additionally, what guidelines are used in to come to a gastrostomy indication? *Goals:* the three most important goals of gastrostomy placement. *Initiating discussion about gastrostomy*: timing of first introduction of the topic of gastrostomy; involvement in decision-making of family, ALS care team members, other and healthcare professionals

(HCP) outside the ALS care team; information sources about gastrostomy provided to patients. *Method of placement:* criteria for preferred method of gastrostomy placement (PEG, PRG, other) or nasogastric tube.

2. Barriers and support needs in indication and decision-making

We included items on barriers and support needs in the indication and decision-making process. *Barriers:* difficulties or barriers in the process of gastrostomy indication and discussion of the topic. *Support needs:* support needed to enhance the process of gastrostomy indication.

Analysis

We used descriptive statistics to summarize responses to multiple choice and dichotomous questions. Responses to open questions were coded by one researcher (RvE) using open coding and discussed with two researchers (AB, WK). For questions on current practices the instances of codes were analysed (content analysis). Generated codes for barriers and support needs were analysed for themes (thematic analysis).

Results

The survey was completed by 29 of 71 physicians (41%) of 27 out of 38 ALS care teams (71%). At the time of survey, respondents had a median experience of 7 years (interquartile range = 3-15) working with ALS and mean of 20 patients in care. Together they were responsible for 590 patients; 32% of these patients had a gastrostomy, of whom 50% had a PEG (*n* = 93), 49% a PRG (*n* = 91). Three patients had a nasogastric tube, one of which was temporary, and one a jejunal endoscopic probe.

1. Current practices regarding gastrostomy

Timing of indication

Clinical indicators. All respondents agreed on the importance of malnutrition/weight loss, dysphagia, and prolonged and effortful meals as indicators for gastrostomy (Table 1). Further important indicators, reported by 80% or more of respondents, were recurrent chest infections, insufficient or unsafe intake of liquids, and low vital capacity. Many respondents did report that they viewed the indicators, including malnutrition/weight loss, as very subjective and interrelated.

Criteria/cutoff values. With regards to malnutrition/weight loss, 76% of respondents uses a loss of 10% or more during the last three to six months as a cutoff value. Other than that, respondents' answers showed uncertainty and a lack of agreement on cutoff values/criteria for indicators. Twelve respondents (41%) mentioned patient's wishes with regard to one or more of the indicators, most commonly in connection to effortful meals (11 of 12) and less often to appetite (4 of 12) and dependency on others (3 of 12).

Goals

All respondents reported optimization of nutritional status as a goal of gastrostomy placement (Table 2). Other frequently reported goals were safe food-intake (72%) and reduction of effortful meals (59%). Only 24% mentioned optimization of quality of life and 7% prolonging survival.

Initiating discussion about gastrostomy

Half of respondents (52%) reported the topic of gastrostomy is first introduced by them, or another member of the ALS care team, early after diagnosis, i.e. during first or second consultation, before an indication for gastrostomy and the need to make a decision (Table 3). The other half (48%) introduces the topic later when there is an indication for gastrostomy.

Method of placement

Independent of other criteria, fifteen physicians (52%) referred to PEG as 'first choice', 'standard', or 'preferred' method of placement versus five respondents (17%) for PRG; nine physicians (31%) did not state a preference for one method over the other (Table 4). Availability of service was also mentioned as a factor partly determining the preference for PEG (14%) or PRG (7%), however, it is frequently mentioned that the alternative is available to the patient at a different hospital in the region. Procedure-related criteria were reported for both PEG (17%) and PRG (59%); and seven respondents (24%) stated that patient preference also plays a role in deciding on the preferred method of placement.

Other methods – Physicians only rarely considered placement of nasogastric tubes or chirurgical jejunal probes. Nasogastric tubes are only considered in case of acute emergency, temporarily pending PEG/PRG placement, or in the terminal phase of the disease. Jejunal probes were only considered if both PEG and PRG were not possible, for example due to unfavorable anatomy.

1. Barriers and support needs in indication and decision-making

Barriers

Two-thirds of respondents (69%) experienced barriers during the indication and decision-making process (Table 5). Five respondents (17%) reported organizational barriers, nine (31%) reported uncertainties over the timing of indication and intervention, and the most frequently reported barrier was promoting patient readiness to make a decision on gastrostomy (48%). Postponement of decision-making was most frequently mentioned in relation to patient readiness, but also rejection of gastrostomy in the face of clinical need. In both situations, physicians said they sometimes find it difficult to decide when and how to discuss the topic in a manner that would support the decision-making process. Finally,

one respondent mentioned frontotemporal dementia as a potential barrier hindering decision-making.

Support needs

Participants reported that more clarity on and evidence for (timing of) indication (35%) and better tools to tailor information to the patient (31%) can support the decision making on gastrostomy (Table 6).

Table 1. Timing of gastrostomy indication

Clinical indicators	**Respondents, *n*(%)**
Malnutrition/weight loss	29 (100)
Dysphagia	29 (100)
Prolonged and effortful meals	29 (100)
Recurrent chest infections	27 (93)
Insufficient intake of liquids	24 (83)
Low vital capacity	24 (83)
Decreased appetite	19 (65)
Dependency on others	10 (34)
Hypermetabolism	2 (7)
Oral hygiene	2 (7)
Criteria/cutoff values *	
Cutoff values for malnutrition/weight loss **	
≥ 10% weight loss in last 3-6 months	22 (76)
≥ 5% weight loss in last 3-6 months	11 (37)
≥ 10% premorbid weight loss	10 (34)
BMI ≤ 18,5	7 (24)
≥ 5% premorbid weight loss	5 (17)
BMI ≤ 20	4 (14)
No explicit cutoff value	2 (7)
Guidelines	**Respondents, *n*(%)**
Dutch guideline PEG placement for patients with ALS (ALS Centre Netherlands 2010)	29 (100)
Motor neurone disease: assessment and management (NICE NG42)	2 (7)

Nutrition support for adults: oral nutrition support, enteral tube feeding and parenteral nutrition (NICE CG32)	1 (3)
EFNS guidelines on the clinical management of ALS (EFNS 2012)	0
The care of the patient with ALS: Drug, nutritional, and respiratory therapies (AAN 2009)	0
Other	
Guideline of ALS care team or affiliated hospital/rehabilitation center	15 (55)

N = 29. * All questions on criteria/cutoff values for the clinical indicators were open questions, except for malnutrition/weight loss for which we provided a choice between seven options based on existing guidelines and relevant literature. ** Multiple answers were possible. BMI = body mass index.

Table 2. Physician goals of gastrostomy placement

Goals	**Description**	**Respondents, *n* (%)**
Optimize nutritional status	… to prevent weight loss and unnecessary muscle loss, and ensure adequate intake of energy, food, liquids, and medication.	29 (100)
Ensure safe food-intake	… to prevent choking, pneumonia, and other respiratory infections due to aspiration.	21 (72)
Reduce effort of meals	… to decrease energy cost, time loss, strain on patient and caregiver, and anxiety over food intake, and provide more time to enjoy what can be eaten and social aspects of eating.	16 (59)
Optimize quality of life		7 (24)
Prolong survival		2 (7)

N = 29. Multiple answers were possible.

Table 3. Initiating discussion about gastrostomy

Decision-making	**Respondents, *n* (%)**
First introduction	
Early after diagnosis	15 (52)
At indication	14 (48)
Involvement in decision-making process	
Family	29 (100)
ALS care team members *	
Speech therapist	29 (100)
Dietician	29 (100)
Social worker	9 (31)
Occupational therapist	8 (28)
Physiotherapist	7 (24)
Psychologist	3 (10)
ALS care team during team meeting	3 (10)
Other healthcare professionals *	
Gastroenterologist	15 (52)
Pulmonologist	13 (45)
General practitioner	7 (24)
Radiologist	6 (21)
Others (i.e. neurologist or nurse specialist, otorhinolaryngologist, anesthetist, case-manager palliative care team, homecare team)	8 (28)
Information provided to support decision-making on gastrostomy	
Website of ALS Centre Netherlands	25 (86)
Brochures from ALS care team	17 (59)

N = 29. * Multiple answers were possible.

Table 4. Selection criteria for preferred method of gastrostomy placement: PEG or PRG

Criteria	Description	PEG, *n* (%)	PRG, *n* (%)
Physician preference	… for one method (PEG or PRG) because this is the 'first choice', 'standard', or 'preferred' method of placement of the physician and/or hospital affiliated with the ALS care team.	15 (52)	5 (17)
Availability of service	… may play a role, in the case of PEG because it is the only available method at the local hospital affiliated with the ALS care team, with PRG available at the regional university medical center; or because there is only collaboration with a radiologist in the case of PRG.	4 (14)	2 (7)
Lower risk of complications	… due to the procedure and less frequent probe changes.	5 (17)	
Contraindication PEG	… due to impaired respiratory capacity or health, or previously failed PEG placement.		17 (59)
Patient preference *	… for PEG over PRG because probe changes are needed less frequently; or PRG over PEG because conscious sedation is not needed during the procedure making the procedure less threatening, anxiety inducing, and uncomfortable in their perception, and this also enables patients to postpone decision-making on gastrostomy.	2 (7)	7 (24)

N = 29. Abbreviations: PEG = percutaneous endoscopic gastrostomy; PRG = percutaneous radiological gastrostomy. Multiple answers were possible. * Two respondents mentioned patient preferences for both PEG and PRG; thus seven physicians mentioned in total mentioned patient preferences in relation to method of placement.

Table 5. Barriers in indication and decision-making

Barriers		Description	Respondent quotes	Respondents, *n* (%)
Experienced barriers				23 (69)
Organization	Organizational barriers	… because of the high number of HCP's and departments involved, lack of expertise with ALS in regional hospitals, and time-consuming referral processes when method of placement is not available locally	'Many patients prefer to do this nearby. I would prefer the ALS Centre because of their experience, care and good aftercare. Away from the ALS Centre, I often find there aren't enough opportunities to have a short, fast and clear discussion about what the problems are, how these can best be dealt with and how the aftercare can best be arranged. I get bogged down with assistants, secretaries, insufficient communication etc.' (Respondent 12) 'First of all, the patient must be registered in the right place and then the dietician must provide proper guidance with the correct information from the hospital where the procedure is to be performed. PEG is done in our hospital, but PRG is not and that requires more energy and time investment on our part to get it right.' (Respondent 26)	5 (17)

Procedure	Uncertainty over timing of indication and intervention	… complicating discussion with patient and family, and placement (i.e. not too early or too late), because of lack of clear cutoff values, interrelated indicators, and unpredictable disease progression	'What does pose a problem is timing. Sometimes there are apparent indications for PEG/PRG whereby it doesn't have to be used for feeding up until death, on the other hand there is sometimes a fairly sudden progression of swallowing problems/weight loss or breathing problems that require intervention at short notice.' (Respondent 3) 'It is sometimes difficult to discuss at the right time when you do not know how quick the progress will be.' (Respondent 28) 'It is a combination of "relative" indicators.' (Respondent 36)	9 (31)
	Uncertainty over risk of complications depending on method of placement (PEG or PRG)		'At other times, there are also complaints/problems after placement of PEG/PRG which (temporarily) reduce functioning/well-being. It is unclear how often this occurs in ALS patients and whether there is a difference between PEG/PRG.' (Respondent 3)	1 (3)
Patient	Promoting patient readiness to make a	… was most frequently reported as a barrier in relation to	'Discussing this is not difficult, but getting people motivated in time is difficult. Many people are reluctant	14 (48)

decision on gastr-ostomy	postponement of decision-making, i.e. unwillingness or inability of some patients to discuss the topic and make a decision on gastrostomy, which could result in placement that was too late when the patient eventually accepted the necessity of gastrostomy. But some physicians also reported struggling to accept patients' choice when they rejected gastrostomy in the face of, according to their physician, obvious clinical need	for (too long) a time and keep waiting and then suddenly turn out to want a tube at a much too late stage (where it previously had been firmly rejected time and time again). How to get more people motivated for this procedure at an earlier stage is a real question for me..' (Respondent 12) 'People are not always open to it, but I do discuss it with them. However, it remains their choice, which can sometimes lead to unpleasant scenes.' (Respondent 46) 'The patient also has a major say in their situation and sometimes wants something other than what is recommended.' (Respondent 64)	
Fronto-temporal dementia hindering process of decision-making		'It can be difficult when there is also FTD [frontotemporal dementia].' (Respondent 45)	1 (3)
No barriers			9 (31)

N = 29. Multiple answers were possible.

Table 6. Physician support needs in indication gastrostomy

Support needs		Description	Respondent quotes	Respondents, *n* (%)
Experienced support needs				17 (62)
Organization	Overcoming organizational hurdles	… to facilitate communication between different teams and healthcare professionals.	'I would like a broader network of places where the choice of PRG/PEG can be considered and discussed. I would like to see shorter lines of communication with the specialised home care provider dealing with the feeding tube (working on it). I think there could and should be a clearer network here, managed nationally but spread across the various regions.' (Respondent 12)	3 (10)
Procedure	More evidence-based indication	… resulting in more clarity on cutoff values, timing, and interrelationship of criteria, a decision tool, and an update of the current guideline including PRG.	'More specific interpretation of indications: when can one still wait (certainly with the increasing range of energy/protein-enriched foods), when is PEG/PRG appropriate, and at what time.' (Respondent 3) 'An update of the [national] guideline would be appreciated.' (Respondent 20) 'I would like to see a decision model that can predict when the patient will need a PEG tube based on e.g., type of ALS,	10 (35)

			survival, swallow score, BMI (or BMI difference score), duration of meals etc., so that the patient can be told: based on how things are now, you will need a PEG tube in 9 months.' (Respondent 35)	
Patient	Tailored patient information	… that includes advantages and disadvantages of gastrostomy, stories of other patients, and more information on the intervention and taking care of the feeding tube.	'What are the advantages and disadvantages (quality of life gain seems to be mainly in subjective indicators such as stressful meal duration/exhaustion, in the case of swallowing problems there is often a clear advantage but weight preservation, for example, is not immediately noticeable for the patient at that moment).' (Respondent 3) 'Stories from experts - explanation of procedure, material, care.' (Respondent 28) 'For the patient, I would like to see stories from people with similar problems, who can tell the patient about their own experiences and dilemmas related to the placement of a feeding tube.' (Respondent 31) 'More opportunities to inform the patient before tube feeding is necessary, for example about the various possibilities for	9 (31)

	administering tube feeding.' (Respondent 64)	
More attention for psychologi-cal factors	'More insight into the psychological factors that may play a role.' (Respondent 65)	1 (3)
No support needs		11 (38)

N = 29. Multiple answers possible.

Discussion

Our study shows practice variation in timing of first introduction of the topic of gastrostomy and method of placement amongst rehabilitation physicians of ALS care teams in the Netherlands. There is agreement on the most important goals and clinical indicators for gastrostomy indication, but not on the cutoff values/criteria for these indicators. The majority of rehabilitation physicians reported support needs related to evidence based timing of indication and placement, tailored patient information, and promoting patient readiness.

In line with international guidelines for ALS (4,5), the most frequently reported goals for gastrostomy in our survey were optimizing nutrition, ensuring safe food intake, and reducing the effort of meals. Although gastrostomy may help preserve health-related quality of life in ALS (20), this was only infrequently mentioned by our respondents and should be considered a secondary goal of gastrostomy together with prolonging survival. A lack of conclusive evidence may explain why prolonging survival was not mentioned as a goal. Although a recent meta-analysis reported a positive effect of PEG on survival (21), another meta-analysis was inconclusive (14) and the most recent study by Vergonjeanne et al. 2021 showed that gastrostomy placement did not have any impact on survival (22). Studies have suggested that earlier placement might enhance survival (22) and prevent further weight loss (13), however, it is debatable whether earlier placement will be acceptable to patients with ALS (3,19).

Respondents agree on the most important, primary clinical indicators for gastrostomy (i.e. malnutrition/weight loss, dysphagia, prolonged and effortful meals, recurrent chest infections, insufficient intake of liquids, low vital capacity). Decreased appetite, increased dependency on others, and hypermetabolism were mentioned less frequently despite research showing their association with weight loss, altered nutritional state through lower energy intake or increased energy needs, or decision-making on gastrostomy (3,23,24). The lack of consensus on cutoff values/criteria for clinical indicators of gastrostomy found in our survey is in agreement with findings from earlier surveys in

England and Canada (11,25) and is reflected in ALS guidelines (4–8). This stresses the need for a more evidence-based indication.

In our survey, half of respondents reported lack of patient readiness as a barrier to decision-making on gastrostomy. Whereas physicians may prefer a more proactive approach to symptom-management, patients and their caregivers may prefer a more reactive, wait-and-see approach (9,18). Decision-making on gastrostomy, another milestone in the disease, can be a difficult and emotional process for patients and their caregivers (2,26) for whom psychosocial factors like coping, illness cognitions, and the need for control may trump medical arguments (3,9,19,27,28). Underlying this may also be a more fundamental paradigm difference by physicians and patients of disease versus illness, i.e. an objective, clinical manifestation versus a subjective, experiential, psychosocial experience (29). This may also be why clinical goals like optimizing nutritional status and ensuring safe food-intake were more frequently mentioned by our respondents compared to enhancing quality of life as a goal of gastrostomy.

Stimulating patient choice in gastrostomy may help to promote patient readiness to make a decision. Patients may desire to postpone decision-making or even decline gastrostomy and this should be respected by physicians while exploring the patient's choice and pointing out the benefits of (timely) placement (2). Meanwhile, dietary changes and supplementation can be explored to provide nutritional support before and after gastrostomy indication (5,15,30). However, physicians in our survey would have preferred patients not to postpone decision-making because this can lead to emergency placements, more complications, and possibly a negative effect on survival. Some respondents also reported finding it difficult to accept patients' autonomy when they declined gastrostomy. There is a delicate balance between patient choice and higher risk of complications and it is recommended that physicians discuss this dilemma with the patient (5). Additionally, cognitive impairments and especially frontotemporal dementia can impair decision-making capacity in ALS (31) and affect patient readiness, however, this was only mentioned by one respondent as a potential barrier.

Similar to studies in England and Canada (11,25), our survey shows that in addition to clinical factors and patient preference, availability of options at the institution, and especially physician preference can play a role when considering the method of placement i.e. PEG or PRG. It has been argued that local availability and expertise should be the deciding factor since these influence the success rate of placement both in terms of mortality, complications, and aftercare (17). PEG-placement is associated with less tube-related complications compared to PRG, but is not always possible when conscious sedation is deemed unfeasible due to respiratory impairment (4,17). PRG has a higher procedural success rate (17) and can take place later in the disease which may be attractive to patients wishing to postpone the procedure. Additionally, the tube needs to

be replaced every three months in PRG but not in PEG. However, since there is no difference in survival between both methods of placement in ALS (13), without contraindication for one of the options, both should be discussed including advantages, drawbacks and safety especially in relation to respiratory failure. Discussing decline of pulmonary function in relation to both timing and preferred method of placement is crucial given the concerns about the safety of PEG tube placement in patients with severely restricted pulmonary function (2). If the patient prefers a different method than locally available they can be referred to another nearby hospital; a number of respondents in our survey report this option. Of course, this is easier in a small, densely populated country like the Netherlands compared to for example Canada.

In such a difficult, emotionally charged decision like gastrostomy (26,32) early and regular discussion of gastrostomy is recommended (5), and gives patients time to think things over and become accustomed to the idea and prevents emergency decision-making (27,33). Additionally, it seems important to explore motivations and emotions underpinning patient preferences, but also possible cognitive deficits (31) and low health literacy which can negatively influence patient decision-making. Decision aids have been proven effective in supporting decision-making (34) and can combine patient information with questions prompting patients to reflect on their preferences to better prepare them to discuss the decision with HCP's (35). Finally, all respondents in our survey included the family of the patient in the decision-making process and provided patients and their families with relevant information. Timely introduction of the topic, providing relevant information, and including the family are all important aspects of shared decision-making which supports patient autonomy in a preference-sensitive decision like gastrostomy (36).

Clinical and research recommendations

First, introduce the topic of gastrostomy early and, depending on disease progress, continue discussing regularly. This enables patients to reflect on their preferences and get accustomed to the idea that they may have to make a decision on this topic in the future and prevents emergency decision-making. Second, provide relevant information to all patients on gastrostomy and method of placement (both PEG and PRG), preferably while a) pointing out the advantages and disadvantages of gastrostomy and method of placement, b) exploring dietary solutions to support nutritional status, c) possible underlying preferences, emotions, and reasons, and d) promoting patient choice. Third, ideally, decision aids and other information should be developed together with patients to provide patient information and support patients in exploring their preferences, which can help physicians to better explore patient readiness and tailor decision-making to individual patient needs. This is not an easy process, but the research group of Hogden and colleagues in Australia provide a useful development pathway that could provide guidance (18,27,35,37). Fourth, prospective studies on gastrostomy in ALS should be conducted

aimed at providing conclusive evidence on efficacy on survival, weight, and quality of life, and on optimal timing. Fifth, clinical implementation studies should explore how ALS care teams can incorporate decreased appetite, fear of dependency on others for feeding, and hypermetabolism in gastrostomy indication and decision-making.

Methodological limitations

At 41% the response rate of rehabilitation physicians was low, however, over two thirds of ALS care teams in the Netherlands were represented in the survey. However, some of the respondents stated that their responses represented the opinion of all rehabilitation physicians within their ALS care team and we assume there to be a large degree of concordance within these teams.

Conclusion

There is evidence of practice variation in timing of first introduction of the topic of gastrostomy and method of placement amongst rehabilitation physicians in the Netherlands. There is agreement on the goals and most relevant clinical indicators for gastrostomy, but not the cutoff values/criteria to come to an indication. More evidence on the efficacy and optimal timing of gastrostomy placement is needed. However, until then early and regular discussion of the topic of gastrostomy based on adequate patient information may promote patient readiness and support patient choice.

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Declaration of interest

The authors report no conflict of interest.

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CHAPTER

6

Control in the absence of choice: a qualitative study on decision-making about gastrostomy in people with amyotrophic lateral sclerosis, caregivers, and healthcare professionals

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Abstract

Background

Gastrostomy is recommended in amyotrophic lateral sclerosis for long-term nutritional support, however, people with amyotrophic lateral sclerosis and healthcare professionals perceive decision-making as complex.

Method

To explore their perspectives on decision-making regarding gastrostomy, we used semi-structured interviews with people with amyotrophic lateral sclerosis, who had made a decision, and their caregivers; healthcare professionals were interviewed separately. Interviews were transcribed and analyzed thematically.

Results

In 14 cases, 13 people with amyotrophic lateral sclerosis and 12 caregivers were interviewed; and in 10 of these cases, 5 healthcare professionals. Participants described decision-making on gastrostomy as a continuous process of weighing (future) clinical need against their values and beliefs in coming to a decision to accept or reject gastrostomy, or to postpone decision-making, while being supported by loved ones and healthcare professionals. Participants described gastrostomy as inevitable, but retained agency through control over the timing of decision-making. They said physical necessity, experiences of loss and identity, and expectations about gastrostomy placement were important factors in decision-making. Decision-making was described as a family affair, with caregivers supporting patient choice. Healthcare professionals supported people with amyotrophic lateral sclerosis during the decision-making process and respected their autonomy and values. People with amyotrophic lateral sclerosis stressed the importance of adequate information on the procedure and the benefits.

Conclusion

People with amyotrophic lateral sclerosis feel in control of decision-making on gastrostomy if they are able to make their own choice at their own pace, supported by loved ones and healthcare professionals. Person-centered decision-making on gastrostomy requires early information exchange and repeated discussions with people with amyotrophic lateral sclerosis and their caregivers, incorporating their values and respecting patient choice.

Introduction

Amyotrophic lateral sclerosis (ALS) is characterized by progressive loss of function and a median survival of three years (1). Increasing difficulty with swallowing (i.e. dysphagia) and chewing, and reduced upper limb function can lead to weight loss and malnutrition which are independent prognostic factors for survival in ALS (2,3). Furthermore, dysphagia can result in aspiration, choking, recurring chest infections, and increasingly prolonged and effortful meals that negatively influence quality of life and cause distress to people with ALS and their caregivers (4). Gastrostomy, either via percutaneous endoscopic gastrostomy (PEG) or percutaneous radiological gastrostomy (PRG), is recommended to provide long-term nutritional support and reduce the risk of aspiration (5–7). However, benefits in promoting survival, weight, or quality of life are less apparent compared to, for example, non-invasive ventilation (3,8–12). Furthermore, healthcare professionals (HCPs) struggle with the lack of evidence-based cut-off values or criteria for indicators (e.g. weight loss, respiratory function, and dysphagia) to support optimal timing of placement (5,12–14). Finally, disease course and rate of disease progression vary per person with ALS, making patient choice and values an important aspect of decision-making on gastrostomy. However, HCPs and people with ALS (4,15,16) experience this decision-making process as complex and difficult.

HCPs may favor a proactive approach to symptom management in ALS (17) and can experience a lack of patient readiness to make a decision as a barrier to (timely) decision-making on gastrostomy (13,14), especially because delayed placement increases the risk of complications with little nutritional benefit, and can make placement impossible due to deteriorating health (5,18). However, recommendations for earlier placement (3,12,19) sit uneasily with people with ALS for whom the impact of gastrostomy goes beyond clinical and nutritional factors (20). To them, accepting or foregoing gastrostomy is one of many difficult decisions on their journey and they may prefer to postpone decision-making (21,22). Reasons include reluctance to give up eating, anxiety about the procedure, and desire to remain in control (4,15,16,23). People with ALS are supported by caregivers during the course of their disease; however, considerations on perceived caregiver burden can also influence decision-making (14,15,24,25). Furthermore, during the disease course loss of speech and hand function – for electronic or text-to-speech communication – may impair their ability to communicate and around half of people with ALS develop cognitive and behavioral impairments with one in eight fulfilling the criteria for frontotemporal dementia [1], both of which may complicate the decision-making process (26). Greater insight into the viewpoint of all primary stakeholders (people with ALS, caregivers, and HCPs) is necessary in order to fully capture the dynamics and complexities of the decision-making process in each particular case.

In this study, therefore, we explored the experiences of people with ALS, their caregivers, and their HCPs with the decision-making process on gastrostomy. Greater insight into the perspectives and experiences of the primary stakeholders will improve support and allow tailoring of information and decision-making to the needs of people with ALS and caregivers, while promoting patient choice.

Methods

Standard protocol approvals, registrations, and patient consent

The study protocol was submitted to the Medical Ethical Committee of the university medical center (UMC) Utrecht (19-583/C) who deemed it exempt from review as the Dutch Medical Research Involving Human Subjects Act was not applicable. Participation was voluntary and written consent was obtained after informing patients and caregivers about the study. If patients were unable to provide written consent due to impaired hand or upper limb function, verbal consent was registered by their caregiver on the informed consent form.

Setting

In the Netherlands, people diagnosed with ALS are referred for care to one of 35 multidisciplinary ALS care teams where ALS care is part of (rehabilitation) palliative care. ALS care teams are coordinated by a rehabilitation physician. Four ALS care teams were involved in the recruitment for this study: UMC Utrecht , Utrecht (where the majority of participants were recruited); Tolbrug Rehabilitation Center, Den Bosch; Rehabilitation Center Klimmendaal, Arnhem; Rijndam Rehabilitation Center, Erasmus Medical Center, Rotterdam.

Participants

Patients and caregivers – Patients were eligible for inclusion if they had a diagnosis of ALS, progressive muscular atrophy (PMA) or primary lateral sclerosis (PLS), an indication for gastrostomy, had made a decision to either accept or decline gastrostomy, and, in the former case, gastrostomy had been placed. Caregivers were eligible to participate if they had been involved in the decision-making process. Patients with cognitive impairments or impaired or absent speech were eligible for inclusion as long as a caregiver was willing to participate in the interview. Patients and their caregivers were recruited by rehabilitation physicians at the four participating ALS care teams in the Netherlands and by one neurology nurse specialist (UMC Utrecht). Patients who expressed interest and their caregivers were sent an information leaflet on the study and contacted by one of the researchers (RvE, NR) to inform them about the study. After informed consent to participate had been obtained, written consent was provided; if patients were unable to provide written consent due to impaired hand or upper limb function, verbal consent was

registered by their caregiver on the informed consent form. After written consent was received, a date, time and interview mode (i.e. face-to-face, video-call or telephone) convenient to the participants were agreed. The interviewers were not known to the participants prior to contacting them for this study.

HCPs – Patients were asked to nominate their HCP who had greatest involvement in decision-making on gastrostomy; they were also invited to participate in a separate interview. RvE was known to two of the HCPs (EKvR, WK), because they work at the same institution (UMC Utrecht) and are part of the research team

Data collection

Patients and caregivers - Semi-structured interviews with detailed probes were conducted by two researchers (RvE, NR) not involved in the care of patients. RvE has been trained to conduct qualitative research and NR has been coached and supervised in conducting interviews and qualitative analysis by RvE. Both RvE and NR were supported by a senior researcher with extensive experience in qualitative research (AB). The interviews were directed by an interview guide formulated on the basis of a literature review (RvE, AB; S1 File). Patients with impaired or absent speech were offered the option to first respond via e-mail to the interview questions. These answers were used to prepare for the interview. Taking patient preferences into account, the interview was conducted and recorded via telephone or video-consultation.

At the start of the interview participant characteristics (gender, age, level of education, diagnosis, decision on gastrostomy (yes or no), method of gastrostomy insertion (PEG, PRG, other, or none), and relationship of caregiver to patient) were registered. During the interview, patients and their caregivers were invited to elaborate on their experiences with the decision-making process regarding gastrostomy: when and how this was discussed, their reasons for accepting or rejecting gastrostomy, the role of HCPs and significant others, and their satisfaction with their decision and the decision-making process. If a decision had been made to accept gastrostomy, they were also asked about the advantages and disadvantages of living with a feeding tube. At the end of the interview or via e-mail, patients and caregivers were asked a few sensitive questions, without the other being present. The patient was asked about the roles of perceived caregiver burden and of significant others in the decision-making process. Caregivers were asked about the burden of mealtimes before and after the placement of the feeding tube, and whether cognitive changes in the patient may have affected the decision-making process. Participants were offered a transcript of the interview to allow corrections and additions (member check).

HCPs – Separate, semi-structured interviews with detailed probes were conducted with HCPs by RvE. The interviews focused specifically on the decision-making process on

gastrostomy of the patient who had nominated the HCP and were directed by an interview guide on the basis of a literature review (RvE, AB; S2 File). At the start of the interview, HCP characteristics were registered (age, position, years of experience with ALS). During the interview, HCPs were asked about when (i.e. at what point in the disease process) and how gastrostomy was discussed with the patient, how the decision-making process proceeded, the dynamics of decision-making between patient-caregiver and HCP, and satisfaction with the decision-making process.

Data analysis

Patients and caregivers - Interviews were transcribed verbatim, anonymized, and analyzed by two researchers (RvE, NR) using an inductive approach. The process of data collection and analysis was iterative, proceeding simultaneously to provide the opportunity for important emerging topics to be incorporated into subsequent interviews. Inclusion proceeded until data saturation was reached, i.e. when no new themes emerged during the last three interviews (26). First, transcripts were read to become familiar with the narrative. Second, the texts were broken down into fragments based on their content and coded independently by two researchers (RvE, NR) in NVIVO 12 (NVivo Qualitative Data Analysis Software; v. 12.6) using open coding (27). Resulting codes and discrepancies were compared and discussed to enhance credibility of the results and minimize interpretation bias. Third, after every 4-5 interviews, existing codes were evaluated by the research team (RvE, NR, AB, WK) and, where necessary, recoded. Fourth, codes were sorted and categorized into overarching themes and subthemes using thematic analysis (28). A descriptive summary of each theme was written and quotes were linked to the themes by one researcher (RvE) to express the essence of the content; themes were discussed by the research team (RvE, NR, AB, WK, EKR).

HCPs - In a similar procedure, the HCP interviews were transcribed verbatim, anonymized, and analyzed by RvE, as described above.

Results

Participants

In 14 cases, a total of 14 interviews were carried out with thirteen people with ALS and twelve caregivers, between June 2020 and August 2021 (Table 1). In 11 cases, dyads were interviewed together; in case 2, the daughter assisted her father in communication without participating in the interview; in case 11, the person with ALS was too tired to participate due to rapid disease progression; case 14 lived alone in a nursing home. In twelve cases the diagnosis was ALS, one PLS, and one PMA; twelve cases had had gastrostomy at the time of interview. Interviews took between 21 and 68 minutes. Data saturation was reached after ten people with ALS and nine caregivers had been

interviewed. All of the participants wanted and received transcripts of their interviews; they provided no comments or feedback on the transcripts.
Additionally, four rehabilitation physicians and one neurology nurse specialist were interviewed about the decision-making process in 10 of 14 cases. HCPs' age ranged from 34 to 58 years and their experience with ALS ranged from 1 to 15 years. Three rehabilitation physicians were not interviewed (cases 6, 7, and 11): one declined to participate, one was on maternity leave, and one did not respond. In one case, no HCP was nominated (case 2) because the person with ALS decided on gastrostomy while he was in the hospital for trial participation.

Table 1. Description of cases

Case	Participant	Sex	Age	Education	Diagnosis	Type of gastrostomy	Mode of communication (person with ALS)
C1	Person with ALS 1	Female	75	High	PLS	PRG	Written, speech computer, making sounds, & non-verbal
	Partner 1	Male	74	High			
C2	Person with ALS 2	Male	65	High	ALS	PRG	Verbal (sometimes difficult to understand)*
	Daughter 2	Female	34	High			
C3	Person with ALS 3	Female	69	High	ALS	PEG	Written, speech computer, making sounds, & non-verbal
	Daughter 3	Female	31	High			
C4	Person with ALS 4	Female	52	Intermediate	ALS	PRG	Written, speech computer, making sounds, & non-verbal
	Partner 4	Male	60	Intermediate			
C5	Person with ALS 5	Male	75	Intermediate	PMA	None	Verbal
	Partner 5	Female	71	High			
C6	Person with ALS 6	Male	72	High	ALS	PRG	Verbal
	Partner 6	Female	69	Intermediate			
C7	Person with ALS 7	Female	60	High	ALS	PRG	Written & making sounds

	Partner 7	Male	60	High			
C8	Person with ALS 8	Male	62	Inter-mediate	PLS/ALS **	PRG	Written & verbal (unintelligible, caregiver translates)
	Partner 8	Female	64	High			
C9	Person with ALS 9	Female	63	Inter-mediate	ALS	PEG	Written & verbal
	Partner 9	Male	64	Inter-mediate			
C10	Person with ALS 10	Male	46	High	ALS	PRG	Written, verbal (unintelligible, caregiver translates), & non-verbal
	Partner 10	Female	40	High			
C11	Person with ALS 11	Female	69	High	ALS	PRG	None ***
	Partner 11	Male	74	High			
C12	Person with ALS 12	Male	62	High	ALS	PRG	Verbal
	Sister 12	Female	65	High			
C13	Person with ALS 13	Female	60	Inter-mediate	ALS	PRG	Written, speech computer, making sounds, & nonverbal
	Partner 13	Male	60	Inter-mediate			
C14	Person with ALS 14	Male	78	High	ALS	None	Verbal

* Daughter assisted her father in communication without participating in the interview. ** Person with ALS was originally diagnosed with PLS which later converted to ALS. *** Person with ALS was too tired to participate.

Themes of the decision-making process

Seven, closely interrelated themes emerged from the interviews; these are graphically presented in Fig 1. Rather than making a decision at a particular moment, decision-making on gastrostomy was described as a continuous process, with people with ALS weighing up the (future) clinical need for gastrostomy against their values, beliefs and expectations, while being supported by significant others and HCPs. People with ALS and their caregivers explained that the weight of these factors shifts over time as the disease progresses. The increasing difficulty with eating and drinking confronts people with ALS with the ongoing loss, thus threatening their identity and forcing them to accept and adapt to change. After deliberating, people with ALS decide to accept or to reject gastrostomy, or to postpone decision-making, on the whole with the support of significant others and HCPs. Finally, despite experiencing an absence of choice when confronted with the progression of their disease, people with ALS explained they experienced control over the decision-making process by controlling the timing and because of the support from their significant others and HCPs.

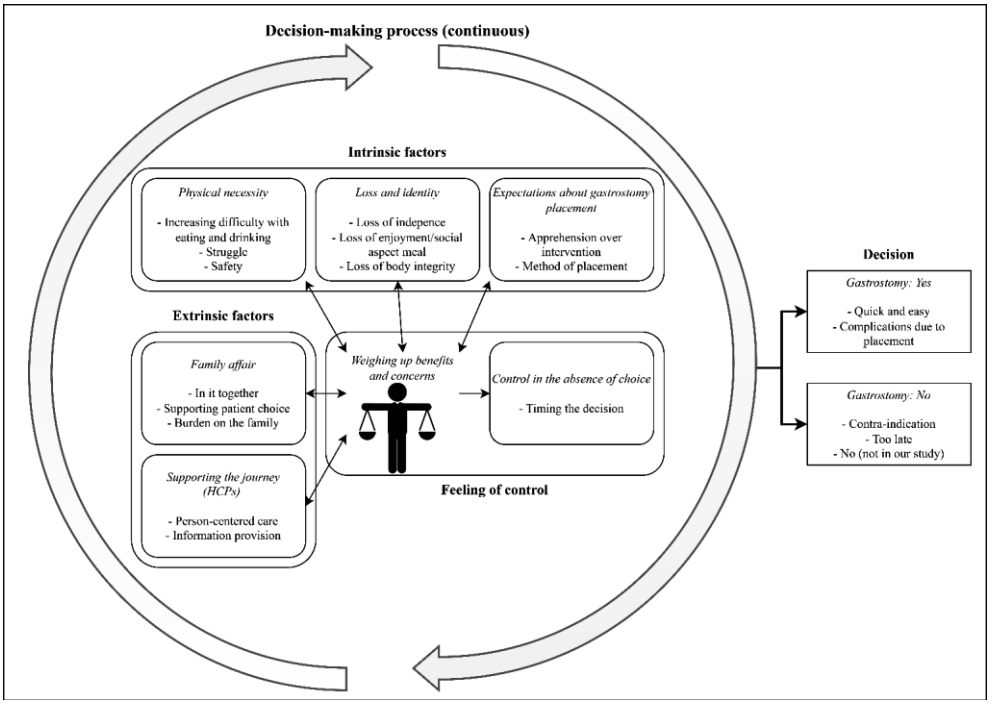

Fig 1. Overarching themes on the experiences of people with ALS, caregivers, and healthcare professionals with decision-making about gastrostomy in amyotrophic lateral sclerosis

Feeling of control

Weighing up benefits and concerns. Some participants explained that for them their concerns weighed more heavily than their clinical needs and the possible benefits; consequently, they declined gastrostomy or delayed decision-making for as long as possible (quotes 1, H1 in Table 2). Emotions associated with loss and identity played an important role, gastrostomy often being viewed as a threat to their independence that would reduce them from being a person to being a patient (quotes 1, H1, 2), but also, to a lesser degree, apprehension over the intervention (see theme 'expectations about gastrostomy placement'). However, over time the weight of these factors would begin to shift as clinical needs began to outweigh their concerns; as the disease progressed, it became harder and harder to ignore the impact of increasing difficulty with eating and drinking, and deterioration in health (quote 2, 3, 4). In the end, they felt they could not delay the decision any longer and were forced to make the 'difficult but necessary' decision to accept gastrostomy (quote 2). Others said physical concerns and their quality of life trumped their emotions and concerns, and they accepted gastrostomy soon after the indication was discussed (quote 5). Information on possible benefits could make their decision easier (see theme 'supporting the journey').

Control in the absence of choice. People with ALS and caregiver interviews revealed a fundamental paradox at the root of decision-making on gastrostomy: making a decision in the absence of choice, i.e. feeling "forced" by the progressive nature of ALS. During the course of their disease, most people with ALS became convinced, they said, that deteriorating physical function, worsening nutritional status, and weight loss, would make gastrostomy – now or at some point in the future – necessary and unavoidable (quotes 3, 6, 7, 9). In fact, many of them accepted early on in the disease that a feeding tube might someday be necessary and thus it did not come as a surprise to them when gastrostomy indication was discussed (quote 7). In some cases, this absence of choice made the decision to accept gastrostomy easier (quotes 7, 8), but others felt that it threatened their independence, making them postpone the inevitable (quotes 1, 9).

Despite the feeling of not having a choice, people with ALS reported that they retained a feeling of control and agency over the decision-making process and the final decision, through the timing of their decision (quotes 9, H2). Some decided on early placement before there was a clear indication (quotes 10, 11). Others made a quick, pragmatic decision when the indication was discussed with them (quotes 5, 7, 8, 11, H3). Finally, there were those who initially declined or postponed decision-making as long as possible to preserve their independence (quotes 1, H1, 9). HCPs explained that rejection of a feeding tube is often a strategy of people with ALS to maintain their independence and a temporary rather than a categorical rejection: a 'no, not yet' rather than a 'no, never' (quote H4).

All involved – people with ALS, caregivers, and HCPs – emphasized the importance of the person with ALS retaining control and facilitating that control (quotes 12, 28, 29, H8, H10). Only one of the people with ALS said they were pressured by significant others or their HCPs to make a decision in favor of or against gastrostomy. The one person who did feel pressured said she felt forced to accept a feeding tube by her family and HCPs after she became depressed and stopped eating (quote 13). None of the caregivers reported changes in personality or cognitive functioning of the person with ALS that impacted on his/her decision-making capacity; nor did the HCPs. In one case the HCP explained that the possibility of co-occurrence of cognitive deficits and communication impairments can sometimes make it difficult to assess the decision-making capacity of that person with ALS; however, this was not the case for this person with ALS according to the HCP (quote H5).

Table 2. Quotes on 'feeling of control' in gastrostomy decision-making

Themes and subthemes	Quotes
Weighing up benefits and concerns	
	Person with ALS 8: "Dismissive, because of the dependency it would inevitably create. … It was a pragmatic decision, which we postponed until it was no longer responsible to do so."
	Quote 1. Person with ALS 8
	HCP 2: "One of the things was that [he] categorically did not want to be dependent on others. That thought held him back for a long time, also in relation to the decision as to whether or not to opt for tube feeding."
	Quote H1. HCP 2 on person with ALS 8
	Person with ALS 4: "I wanted to know more [when gastrostomy was first discussed], but wasn't ready for it yet. I could still eat. … After a year [I accepted gastrostomy.]… Difficult but necessary… Eating was becoming difficult and I was losing weight fast… I see it as yet another step backwards. … I also wanted to continue to eat independently, no matter how difficult it was."
	Quote 2. Person with ALS 4
	Partner 4: "You're both perfectly aware of what's coming and that, sooner or later, you're literally not going to have a choice. … Eating got so difficult at one point … choking a lot, taking in very little food, that [she] also started realising it was inevitable. She really didn't have a choice."

	Quote 3. Partner 4
	Person with ALS 10: 'Not in the middle of 2015 [when gastrostomy was discussed] but early in 2020 did I decide to accept a feeding tube … because I started to choke more often and swallowing became more difficult. And I started to lose weight.'
	Quote 4. Person with ALS 10
	Person with ALS 6: "Then the rehabilitation doctor suggested we start with tube feeding. And I actually accepted that straight away. ... The fear of losing weight was much greater than looking into the possible consequences of tube feeding."
	Quote 5. Person with ALS 6
Control in the absence of choice	
Absence of choice	Partner 8: "There really was no way around opting for tube feeding if we wanted to try and maintain the weight. Person with ALS 8: [says something unintelligible] Partner 8: "No, that's right, you didn't have a choice. That's right. You reach a point where all that's left is what you can still do, rather than about what you want to do."
	Quote 6. Person with ALS 8 & partner 8
	Partner 11: "But of course you've started looking into the disease a bit more at this stage, so it didn't exactly come as a huge shock. You know beforehand that it's going to happen at some point. She was eating all day, then the choice isn't all that difficult."
	Quote 7. Partner 11
	Person with ALS 1: "Eating and drinking became increasingly more difficult. No [not a hard decision], consuming food normally turned into a downright disaster. … It was simply a fait accompli."
	Quote 8. Person with ALS 1
Timing the decision	Person with ALS 10: "Not a hard decision, I knew it was coming. … I'm in control of things myself. So I decide whether or not I want to do something. …" Partner 10: "He also knew that [tube feeding was inevitable] and you were sort of delaying that." Person with ALS 10: "Yes."

Quote 9. Person with ALS 10 & Partner 10

HCP 3: “She did have control and, as her weight had stabilised, there was no great urgency to get it done. But the fact that her swallowing function was also continuing to decline meant she knew it needed to be done. … She managed to retain her dignity, in the sense that she liked to stay in control of things herself.”

Quote H2. HCP 3 on person with ALS 13

Person with ALS 2: “I'm completely open to as many adjustments and aids as possible, as long as they help make life worth living. … I decided to indicate that I wanted to make that choice. … You're much more dependent on others without aids.”

Quote 10. Person with ALS 2

Partner 7: “We especially didn’t want to end up in a situation where we no longer had a choice. And you can really only make things easier for yourself if you preventively can stay one step ahead of the inevitable.”

Quote 11. Partner 7

HCP 4: “This is an extraordinary patient who, apparently, can accept things very easily and actually turn them into something positive. ... Normally discussing both a PEG and non-invasive ventilation is quite stressful for people, as this once again indicates a huge step and a machine. … He took that incredibly well.”

Quote H3. HCP 4 on person with ALS 12

HCP 2: “Right from the beginning he had also said, 'yes, at some point it’s going to be necessary, but I don't want it yet'. So I think with him it's always been more of a no-not-yet scenario, rather than a definitive no.”

Quote H4. HCP 2 on person with ALS 8

Person with ALS 4: “Ultimately made the decision myself. … I thought that initial meeting, more than a year earlier, was too soon and no one was difficult about this. …”

Partner 4: “[She] decides what happens to her and no one else. She was able to make that choice herself. I’m sure she felt that was very important.”

Quote 12. Person with ALS 4 & partner 4

Person with ALS 3: “More or less forced into it because I continued losing weight. … I no longer had any interest in life as an ALS patient during the time I had to decide on tube feeding. I was severely depressed. …”

Daughter 3: “We, the family, more or less pushed [the decision] through together with the healthcare professionals. …”

Person with ALS 3: “Hardly a choice… it ended up being forced. … But [in retrospect] that PEG isn't as bad as you think.”

Quote 13. Person with ALS 3 & daughter 3

HCP 1: “I have, on occasion thought, ‘how is he cognitive?’ … I can't always be sure, especially as he doesn’t always completely answer your questions. … But it simply doesn’t have any further consequences and [his wife] dismisses that too.”

Quote H5. HCP 1 on person with ALS 5

Intrinsic factors

Physical necessity. People with ALS and their caregivers described how, over time, mealtimes became increasingly difficult with eating and drinking becoming a challenge (quotes 14, 15 in Table 3). They explained that they struggled to sustain the weight and adequate nutritional status of the person with ALS; this would take an increasing amount of time and energy (quotes 14, 16); loss of appetite might also play a role for some participants (quote 17). As swallowing became more difficult, safety would become an increasing point of concern (quotes 3, 18).

Loss and identity. As their disease progressed, people with ALS reported being confronted by loss, related to mealtimes, eating, and the idea of a feeding tube which threatened their values and identity. Emotions associated with increasing dependency and becoming a patient were particularly strong for some (quotes 1, H1, 19). It was difficult to give up eating, and gastrostomy was viewed as yet another step in the progression of their disease (quotes 20, 21). The loss of enjoying taste and the social aspect of meals was also remarked upon by a number of participants (quote 22). Loss of body integrity might also be relevant. One person described the idea of a feeding tube as a violation of the integrity of her body (quote 23), and another participant said he viewed being dependent on all kinds of machines to continue living as unnatural (quote 48).

Expectations about gastrostomy placement. Some participants described being apprehensive about the placement of a feeding tube, due to fear of pain (quote 24), and because they felt helpless, due to their inability to communicate and control their own body (quote 25). This apprehension could be exacerbated or ameliorated by the information provided by HCPs (see theme ‘supporting the journey’). A few people with

ALS said they would prefer a PEG rather than a PRG and, therefore, decided on early, timely placement (quote 26).

Table 3. Quotes on 'intrinsic factors' in gastrostomy decision-making

Themes and subthemes	Quotes
Physical necessity	
Increasing difficulty with eating and drinking	Person with ALS 1: "Eating normally became a true disaster...because it simply fell out of the mouth. …" Partner 1: "Those lovely meal moments turned into a confrontational drama. … [And] the weight loss that really needed to stop. … That's obviously life-threatening." **Quote 14. Person with ALS 1 & partner 1**
	Person with ALS 6: "Eating more just wasn't possible. … Your very fine motor skills are gone from your hands." **Quote 15. Person with ALS 6**
Struggle	Person with ALS 9: "I had to work incredibly hard throughout the day to ingest enough food to maintain my weight … and drinking became trickier too. …My tongue can't do an awful lot anymore." **Quote 16. Person with ALS 9**
	Person with ALS 6: "My appetite had all but disappeared because both my smell and taste had gone. So that inevitably results in you eating a great deal less." **Quote 17. Person with ALS 6**
Safety	Person with ALS 14: "I found eating [increasingly] more difficult. … It seemed to go wrong every time, pieces would get stuck in your trachea and then you'd end up being short of breath." **Quote 18. Person with ALS 14**
Loss and identity	
Loss of autonomy	Partner 8: "I think it's mainly about the fact that this will definitely make [him] a patient. That was the biggest stumbling block. … [He] is a very autonomous human being. … Being dependent on others is a very sensitive subject to him and he would have liked to have avoided that at all cost." **Quote 19. Partner 8**

	Person with ALS 4: "[I] wasn't ready for it yet. … I found it incredibly difficult to give something up yet again. …" Partner 4: "You keep on having to give up a little bit of your quality of life, which then, putting it bluntly, brings you one step closer to death every time. … That's obviously really confrontational." **Quote 20. Person with ALS 4 & partner 4**
	Person with ALS 7: "It wasn't a difficult decision. Although it *was* one which had a great deal of impact, as it was yet another step backwards. … Mentally it's incredibly hard to keep giving in." **Quote 21. Person with ALS 7**
Loss of enjoyment/ social aspect meal	Person with ALS 1: "No more taste experiences. I really miss the joy of eating together. …" Partner 1: "Of course it's not particularly social." **Quote 22. Person with ALS 1 & partner 1**
Loss of body integrity	Person with ALS 3: "Difficult decision, invalidating, unnatural. … I hated it. There's a hole in the body and something which is always visible, so it instantly feels like a disability." **Quote 23. Person with ALS 3**
Expectations about gastrostomy placement	
Apprehension over intervention	Daughter 3: "She was very anxious about it and dreading the pain and then there's obviously pain afterwards. That's horrible." **Quote 24. Daughter 3**
	Person with ALS 4: "I [was] dreading being admitted to hospital, because I can no longer do anything independently." Partner 4: "[She] is almost completely paralysed, she can't speak, and then when you end up in the care of others and you can't express exactly what you want or what you're looking for… that's obviously really, really difficult. They weren't able to get her out of bed properly, use a hoist, and what more." **Quote 25. Person with ALS 4 & partner 4**
Method of placement	Person with ALS 9: "It's much better to have a PEG tube placed when you're feeling fit, then having a PRG tube placed in a worse condition, as this needs to be replaced every four months and the balloon can burst. I really don't like the idea of that."

Quote 26. Person with ALS 9

Extrinsic factors

Family affair. When discussing the decision-making process about gastrostomy, people with ALS and their significant others described it as a family affair and emphasized that they were in it together (quotes 27, H6 in Table 4). People with ALS said they felt supported during decision-making by their family and loved ones, who emphasized the importance of respecting the choice and autonomy of the person with ALS (quotes 12, 28,29). However, as mealtimes became increasingly difficult, caregivers did report increasing feelings of helplessness and worry about the person with ALS' health and safety, which could turn mealtimes into a source of tension for both of them (quotes 29, 30) and increase the caregivers' burden of care (quote 31, 32). In these cases, some caregivers reported discussing gastrostomy more frequently (quote 33). Also, one couple described the traumatic impact of their young child seeing his father choking and the added strain on the mother (quote 32). However, caregivers did not complain about their burden of care (quote 29, 31), and people with ALS said their decision had not been determined by concerns about caregivers' burden of care (quote 29).

Supporting the journey (HCPs). HCPs described person-centered care aimed at supporting the person with ALS on their journey while respecting their autonomy, values, and dignity (quotes H7, H8); this was echoed by people with ALS and caregivers (quotes 12, 34). Their role during the decision-making process, HCPs explained, was to discuss when gastrostomy was indicated and for what reasons, to make sure the person with ALS was fully informed about the pros and cons, to keep the decision-making process alive by repeatedly discussing the topic as long as a final decision had not been made, while supporting the autonomy of the person with ALS, and respecting their choice and values (quotes H8, H9, H10). Nevertheless, sometimes people with ALS and caregivers felt the topic was raised too early (quote 35).

When coming to an indication, HCPs explained that the timing was relative and dependent on multiple indicators (quote H11). Discussing gastrostomy with people with ALS and their caregivers was seen as a multidisciplinary effort. In addition to the rehabilitation physician, many specialists were involved including dieticians, speech therapists, and specialist nurses (quote H9, 36). People with ALS and caregivers explained that this multidisciplinary approach increased their satisfaction with the decision-making process because of the complementary input provided by HCPs (quotes 34, 36, 37, 38). Information about the feeding tube provided by HCPs could help them reach a decision. Some of the possible benefits were stabilization of weight (quote 39), reduced risk of suffocation (quote 40), reduced energy loss due to effortful meals, and easier intake of medication and fluids (quote 36). Experiences of others with ALS (quote 41), information

about still being able to eat as well as tube feed (quotes 42), and reassurance about the intervention (quote 36) were also mentioned as helpful for people with ALS and caregivers in making a decision. However, sometimes participants said HCPs downplayed gastrostomy placement as a minor surgical procedure while not taking sufficient account of their worries (quote 43). Careful explanation of the procedure that is sensitive to the fears and emotions of people with ALS and caregivers can reassure them about the procedure (quote 37). In retrospect, some people with ALS and caregivers also said they would have wanted more information about possible complications and drawbacks of placement and tube feeding (quote 44).

Table 4. Quotes on 'extrinsic factors' in gastrostomy decision-making

Themes and subthemes	**Quotes**
Family affair	
In it together	Person with ALS 13: "In consultation with my partner. … We work together to figure out the best solutions. …" Partner13: "We decided that together." **Quote 27. Person with ALS 13 & partner 13**
	HCP 2: "[Partner] supported him unconditionally. Was also a pragmatic person, solution-focused ... so they certainly always did that together." **Quote H6. HCP 2 on person with ALS 8**
Supporting patient choice	Partner 10: "[He] likes to be in control. Of course we've discussed this together, but it's [his] body and it's also [his] decision." **Quote 28. Partner 10**
	Person with ALS 9: "My husband has always supported me and I don't think this is too much for him ... I've not allowed myself to be influenced by my environment. They don't know what it's like to be me and what eating and drinking is like for me." Partner 9: "Absolutely not, I do it with love. But of course you notice that it results in a certain amount of tension in yourself too." **Quote 29. Person with ALS 9 & partner 9**
Burden on the family	Person with ALS 8: "I wasn't [eating] enough, my partner tried to encourage that. Eating pretty much turned into an obsession. …"

	Partner 8: "You're naturally worried about it. You can already see someone's losing weight and that aversion to food starts to build up. So I really tried to push as much as I could."
	Quote 30. Person with ALS 8 & partner 8
	Partner 15: "Now I'm feeding all day. So that burden has now shifted to me, although it's obviously no burden to me whatsoever, but it *is* my responsibility."
	Quote 31. Partner 15
	Person with ALS 10: "Also when children are around ... which can obviously leave them with some traumatic experiences."
	Partner 10: "[He] has choked badly enough on a few occasions that he literally couldn't breathe for a significant amount of time. … We have a seven year old son."
	Person with ALS 10: "He used to crawl behind the sofa."
	Partner 10: "... He certainly wasn't the best eater either and that sometimes demanded some attention too. So the whole process of cooking, eating, clearing up etc could take a couple of hours in total."
	Quote 32. Person with ALS 10 & partner 10
	Partner 4: "It's a process and it takes a very long time. I'd been saying that for months and at a certain point she realised there's no other way."
	Quote 33. Partner 4
Supporting the journey (HCPs)	
Person-centered care	HCP 2: "I think that's actually one of the great things about our profession, that you can get so close to someone – make it so personal, think along with someone like this, empathise – and watch that person go through the process of arriving at a decision like that."
	Quote H7. HCP 2 on person with ALS 14
	HCP 2: "I really do strongly [feel] that tube feeding should be any individual's own choice: are you or are you not going to do it. As long as you're clearly informed of what it will result in, all the pros and cons. … Who am I in this? Why would I push for tube feeding?"
	Quote H8. HCP 2 on person with ALS 8
	Person with ALS 8: "Brochures and personal conversations. The latter were particularly helpful. [Healthcare professionals were] informative and pleasant, so much so that we could ultimately draw our own conclusions.

	The [specialist nurse] didn't apply any pressure. We were able to grow towards that decision as a result of the step-by-step information and all the conversations over time."
	Quote 34. Person with ALS 8
	HCP 2: "We discussed it several times. … The dietician, for example, mentioned it a few times. … So it's always been a topic of conversation … in a nice way. And then came that informative conversation with the [specialist nurse], during which he was given an explanation and that certainly gave him something to think about."
	Quote H9. HCP 2 on person with ALS 8
	HCP 3: "It was very much up to her to identify that 'yes, now' moment. … This is a patient who hugely values self-management and who wants to wait for as long as possible, despite being made aware of all the pros and cons."
	Quote H10. HCP 3 on person with ALS 13
	Partner 4: "That's confrontational. … These [aids] can sometimes be introduced to the conversation at a very early stage."
	Quote 35. Partner 4
Information provision	HCP 2: "There are also no definite cut-off values for [optimal timing of placement] ... This gentleman had swallowing problems, things were by no means optimal and he was losing weight. And yes, then you do have more of a sliding scale, the indication was certainly there before, but it wasn't a case of "imminent death" either."
	Quote H11. HCP 2 on person with ALS 8
	Person with ALS 9: "The speech therapist told me I needed a great deal of energy for both talking and eating and that this [feeding tube] would mean I didn't need to fight quite so hard. The PEG nurse reassured me about the procedure. … The fact that I can just use it for water or put medication in it too."
	Quote 36. Person with ALS 9
	Daughter 3: "We also received an explanation from the specialist nurse. … And I thought she really clearly explained what it's like for the patient. … Of course that it's quite nerve-racking, but also explaining about the placement and what happens afterwards. … I thought that was all very pleasant. …"

Person with ALS 3: “She [nurse specialist] was better than the doctor.”

Quote 37. Person with ALS 3 & daughter 3

Person with ALS 13: “Nice conversation [with the rehabilitation doctor]. …”

Partner 13: “I don't think you have a great deal of choice about whether or not to do it. … And perhaps the decision-making is made just that little bit easier during these conversations, because you’re being so effectively informed about everything.”

Quote 38. Person with ALS 13 en partner 13

Person with ALS 6: “It was a personal choice, but definitely hugely influenced by what the rehabilitation doctor said ... that this is the only option if you want to be able to maintain your weight.”

Quote 39. Person with ALS 6

Person with ALS 12: “I have to admit to being a little worried about that. Because you do hear some stories about people choking and them almost having to be turned upside down to get it back up again.”

Quote 40. Person with ALS 12

Person with ALS 2: “A fellow patient was given a PEG tube. She didn’t think the procedure was too bad. … The decision wasn’t difficult, because I already knew two patients who were being tube fed.”

Quote 41. Person with ALS 2

Person with ALS 12: “So [in addition to the tube feeding] all I need to drink is red wine and eat Tony’s Chocolonely [chocolate]. … I only need to eat things I like and I’ll still maintain my weight.”

Quote 42. Person with ALS 12

Daughter 3: “Of course inserting such a PEG tube is really just a routine procedure. ... The nurses talked about it like it was just something to quickly get done. I know it doesn’t take a huge amount of effort, but having a tube inserted into your stomach is no joke.”

Quote 43. Daughter 3

Person with ALS 6: “I would have liked ... more information about the consequences ... and I feel I received little or no information about that.”

Quote 44. Person with ALS 6

Decision to accept or reject gastrostomy

Faced with the perceived inevitability of gastrostomy due to the progressive nature of their disease, in our study, all but two people with ALS decided they wanted and received a feeding tube. Once the decision to accept a feeding tube was made, people with ALS and caregivers were happy that the follow-up process was quick and easy, with prompt placement (quote 45 in Table 5). Unfortunately, for a few people with ALS placement caused pain (quotes 24, 46) or emotional distress due to their inability to communicate, which could be further compounded by nursing personnel, lacking experience with ALS (quote 25).

Of the two people with ALS who did not accept a feeding tube, one explained he did not consider gastrostomy a viable option because of fear of serious complications related to his medical history (quote 47). The other person recounted resolutely rejecting a feeding tube time and again until, very late in the disease course, he changed his mind, but then it was too late because his physician told him he had become too weak (quote 48). None of the participants expressed a principled rejection of gastrostomy.

Although some people with ALS experienced complications from the placement, or strong emotions surrounding loss, none of them expressed regret about their decision or the timing of these decisions; this included the person who felt forced by her family (quote 13) and the one who was too late (quote 48). HCPs also expressed their satisfaction with the decision-making process – regardless of what the person with ALS decided – as long as they had been well-informed and had made the decision based on their own values (quotes H8, H10). In the case of one person who had postponed the decision for a long time, the HCP said she was happy that postponement had not caused any complications (quote H12).

Table 5. Quotes on the 'decision' to accept or reject gastrostomy

Themes and subthemes	Quotes
Quick and easy	Person with ALS 7: "We didn't take a lot of time to decide, so I ended with a feeding tube within a month of my decision."
	Quote 45. Person with ALS 7
Complications	Person with ALS 2: "[I experienced] an awful lot of pain during the initial week after placement."
	Quote 46. Person with ALS 2
Contra-indication	Person with ALS 5: "It was 45 [% success versus] 55% [no success]. Well, that's not a risk I'm willing to take."
	Quote 47. Person with ALS 5

Too late	Person with ALS 14: “So I said 'I don't want to do that, I don't want to live like a plant'. … I didn't really want anything at the time, I just wanted to go naturally. …. But I did eventually come to the realisation that being tube fed doesn’t mean you’re a plant. … [But the rehabilitation doctor] thought I was already too weak … they no longer thought that was a good idea. … I honestly believe it was simply my own fault.”
	Quote 48. Person with ALS 14
	HCP 1: “Of course you’re glad she didn’t end up with pneumonia and that the procedure went well. That there weren't a multitude of complications, because that’s obviously the last thing we would have wanted. That was clearly all a downside of waiting. And those [risks] obviously increased for her.”
	Quote H12. HCP1 on person with ALS 4

Discussion

In this study, we show that decision-making on gastrostomy is a complex and continuous process during which people with ALS weigh (future) clinical needs against their values and preferences. They often describe gastrostomy – at some point during their disease – as inevitable, due to the progressive nature of ALS. Nevertheless, despite what they described as an absence of choice, they said they felt in control of decision-making because they were supported by HCPs and loved ones to make their own decision in their own time.

Feeling of control

On their journey, people with ALS are confronted by a relentless, progressive loss of function and loss of control over their body, that threatens not only their independence, but also their identity and autonomy as a person (30,31). In response, they try to retain and regain control over their lives by exerting control over their healthcare, deciding when and how to engage with healthcare services, what aids to accept and when (32). Regaining control helps promote a feeli3g of self-worth and personal integrity (31). This and other qualitative studies (4,15,16,32) show different approaches by people with ALS towards decision-making on gastrostomy ranging from (early) acceptance, postponement, to refusal, based on their individual consideration of physical necessity versus their values and preferences, and expectations about gastrostomy placement. Some may take control and try to get ahead of their disease by choosing proactive, early placement before there is a clear indication; others accept placement soon after the indication is discussed with

them (15,33). They view gastrostomy as an aid rather than a threat to their independence and quality of life, or as a necessary solution to their increasingly difficult, stressful, and time-consuming struggle with eating and drinking (16,33). But even more crucial is their conviction that gastrostomy – now or at some point in the future – would become inevitable (15). Greenaway et al. suggest (15) that 'those who felt they had no choice but to accept an intervention' did not feel in control. However, similar to our findings, people with ALS and their caregivers in a recent study by Paynter et al. (34) described a 'window of opportunity' in which they still experienced some control before the disease had progressed too much; especially where decision-making about (early) gastrostomy placement was concerned. People with ALS in our study said they felt in control because it was their own decision which they were allowed to make in their own time.

Besides early acceptance, postponement of decision-making and initial refusal may be strategies aimed at protecting independence and retaining control over their lives and healthcare (15), with other factors like reluctance to give up oral feeding, fear of the procedure, a desire to preserve their body integrity, etc. also playing an important role (4, 15, 33). However, this and other studies (16,33) show that people with ALS who initially postponed or declined may also come to view gastrostomy as inevitable and end up accepting placement when physical necessity increases and begins to outweigh their feelings of loss, threat to their identity, and concerns over placement. It is, therefore, important to discuss the topic of gastrostomy at regular intervals because even initial and repeated rejections may turn out to be a "no, not yet" rather than "no, never". In a recent study by Paynter et al. (34) people with ALS and their caregivers also described this 'window of opportunity' during which they still experienced some semblance of choice and control over decision-making. Moreover, Paynter et al. (34) suggest that a feeling of control may be what differentiates decision-making about (early) gastrostomy placement from other decisions in ALS which their participants described as not being a decision because there was no choice. We would suggest that most people with ALS – despite coming to view gastrostomy as inevitable at some point during their disease – will feel in control of the decision-making process when they are able to make their own choice, in their own time, and supported by their HCPs and loved ones.

Supporting the journey (HCPs)

The interrelatedness of patient choice and timing underscores the complex nature that characterizes decision-making on gastrostomy – and other healthcare decisions – in ALS (30, 31). HCPs can struggle with the lack of evidence about optimal timing of gastrostomy placement and a lack of patient readiness regarding decision-making (13,14). Hogden et al. (17) describe a multi-stage model that can support HCPs in engaging people with ALS and their caregivers in patient-centered decision-making. The role of the HCP is to support patient choice and control over decision-making by exploring their preferences and values

(participant engagement), establish choices and (optimal) timing of each choice ensuring they have 'sufficient resources to make informed choices' (option information), and support them in deciding between 'proceeding with a symptom management option, and deferring their decision to a later time or choosing to do nothing' (option deliberation) (17). Our study shows that presenting the option to accept or decline, or postpone decision-making as valid choices, while explaining advantages and drawbacks of each option, allows people with ALS to make their own, informed decision in their own time while feeling supported by their HCPs, and increasing their satisfaction with and feeling of control over the decision-making process.

Hogden et al. (17) also point out a number of barriers to successful decision-making. Prolonged deliberation because people with ALS delay or initially refuse gastrostomy may cause tension with HCPs' desire to maximize health outcomes, as was also shown in our survey of rehabilitation physicians in the Netherlands (13). Late gastrostomy placement is associated with a higher risk of complications, or placement may no longer be feasible due to deteriorating health, as was the case with one person in our study who changed his mind after having repeatedly declined gastrostomy (5,18). However, feeling pressured by HCPs to consider and accept gastrostomy can cause people with ALS and their caregivers distress, and damage the relationship with the patient (15). Patient choice is especially important because the clinical benefits of gastrostomy on survival, weight, or quality of life are less clear-cut and measurable compared to NIV (3,8–12) and conservative management should be considered a valid option (35). Accepting well-informed patient choice that could result in an increased risk of complications, or mean that placement is no longer feasible, can be difficult for HCPs, but respects patient autonomy and their values.

During the course of their disease around half of people with ALS develop cognitive impairments, and about one in eight frontotemporal dementia (1), which may impair decision-making capacity (17,26,36). However, only a small minority of people with ALS may actually be incapable of giving consent to treatment (37); moderate cognitive and behavioral impairment may not impact decision-making on gastrostomy or NIV (38). We did not succeed in including cognitively impaired people with ALS in our study; more research on the impact of cognitive deficits on healthcare decision-making is needed (26).

Some participants in our study said they felt insufficiently informed about possible complications due to gastrostomy placement. Only when HCPs explain possible benefits, but also potential drawbacks and complications – even if this may cause them to postpone or refuse – will people with ALS, together with their caregivers, be able to make an informed decision (17). Our study also showed that when gastrostomy placement is described as a minor surgical procedure, people with ALS – who may be largely helpless without the ability to move their arms and legs, and incapable of communication – may

feel that not sufficient account is taken of their worries; this runs the risk of increasing their anxiety, whereas careful explanation sensitive to their fears can be reassuring (39). HCPs walk a difficult tightrope between explaining clinical benefits versus drawbacks, exploring and accommodating values and preferences of people with ALS, and respecting patient choice. Stories of other people with ALS that reflect both the risks and benefits of the different choices might be valuable in helping people with ALS make better informed decisions as long as these are reliable and properly contextualized (33).

Family affair

ALS has been described as a family illness with loved ones providing emotional support and taking on many aspects of care (40). This can be a significant burden on caregivers, spouses especially, as the disease progresses (41). Increasingly difficult mealtimes and food preparation, especially when young children are involved, increase caregiver burden and distress, as well as their worries over the health and safety of their partner (4,33). However, tube feeding may come with its own burden on caregivers (42). Acknowledging and discussing these topics provides an avenue for HCPs to contextualize and discuss patients' values and decision-making on gastrostomy. People with ALS dislike feeling they are a burden (25); they may refuse gastrostomy or other interventions, which they perceive to be life-prolonging, in order to not extend the burden of care on loved ones, or accept these – against their own preferences – because their family wants them to carry on living (15,24,33). In our study, people with ALS said caregiver burden did not play a role in their decision to accept or decline gastrostomy. Except for one person who was depressed, none of our participants felt forced or pressured to make a decision against their own preferences. Rather, caregivers emphasized that their partner was not a burden and that it was their decision. As a result, people with ALS in our study did not describe themselves as a burden and said they engaged in collaborative decision-making together with their partners. This underscores the importance of involving loved ones during every stage to facilitate patient-centered decision-making (17).

Generalizability

Our study and others (4,15,16,33) show the complex and value-laden nature of decision-making on gastrostomy. Similar to ALS, concerns about the impact on social life, body integrity, uncertainty and anxiety about the procedure, and caregiver burden also cause decisional conflict in other diseases (43). Patients with other progressive diseases (e.g. multiple sclerosis) also emphasized the absence of choice where gastrostomy was concerned (44). Studies have also shown the importance of the role of HCPs and information provision; HCPs' poor communication, blasé attitude towards gastrostomy and placement, lack of or inappropriate information, and a paternalistic attitude have resulted in patients and caregivers feeling dissatisfied or excluded from the decision-

making process (39,44). Our study shows that multidisciplinary ALS care can make it easier to establish a positive relationship with one or more HCPs, and provides information from different, but complementary specialties, helping them to make better, informed decisions. Furthermore, we show that person-centered, multidisciplinary ALS care with HCPs who treat the patient as a person by exploring their values and preferences, respecting their choice, and supporting them during decision-making, reinforces people's autonomy, and makes them feel in control of and satisfied with the decision-making process.

Strengths and limitations

An important strength of this study is that all primary stakeholders – i.e. people with ALS, caregiver, and HCP nominated by the person with ALS – were interviewed. The triangulation of multiple viewpoints enhances the credibility of our findings. Another strength of our study is that we included people with ALS with impaired or absent speech, which is often the case by the time gastrostomy becomes relevant. This was made possible through a flexible approach similar to that proposed by Howard et al. (2021) (45). We provided people with ALS with the opportunity to respond to the questions by e-mail preceding the actual interview. Then they and their caregiver were interviewed together. The opportunity to respond via e-mail also helps to overcome the risk that the views expressed represent those of the caregiver more than of the person with ALS. In the case of absent speech, people with ALS regularly interjected to correct or add to caregiver responses using communication aids, making sounds, or non-verbal communication; cues which were used by the interviewers, where necessary, to ask follow-up questions. Finally, both participants were asked questions on more sensitive topics about caregiver burden and impaired cognition in private (this could also be via e-mail). Another important strength is the qualitative study design which allows us to capture the complexity and individual nature of decision-making on gastrostomy in ALS.

One limitation is that, except for case 11, our study did not include people with ALS with a very fast disease progression. A rapid progression may make it hard to adapt to loss and make a decision in time, before the reality of their disease has overtaken them. But for others, rapid progression can make it easier to accept gastrostomy, because there is no time to delay.

Conclusion

Person-centered decision-making on gastrostomy requires early information exchange, and repeated discussions by HCPs with people with ALS and their caregivers, in which their values are incorporated, and patient choice – i.e. accept, decline, or postpone gastrostomy – respected. This helps support the autonomy of people with ALS, makes

them feel in control, and increases their satisfaction with the decision-making process (Fig 2).

Clinical recommendations

Support the autonomy and increase the feeling of control of people with ALS during decision-making about gastrostomy by:

- Discussing gastrostomy early and repeatedly
- Exploring and respecting the values and preferences of people with ALS and tailoring information accordingly
- Presenting the available decisions –i.e. (early) acceptance, postponement, or refusal –as equally valid while explaining the pros and cons of each option
- Supporting them during decision-making and respecting patient choice
- Making the decision-making process a multidisciplinary effort by involving all relevant HPCs –e.g. neurologist/rehabilitation physician, dietician, occupational therapist, physiotherapist, nurse specialist
- Involving caregivers from the start

Fig 2. Clinical recommendations for decision-making about gastrostomy in ALS

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Supporting information

S1 File. Interview guide patient and caregiver

S2 File. Interview guide with healthcare professionals

S3 Table. COREQ checklist

S4 Table. Researcher credentials

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Supplements

S1 File. Interview guide patient and caregiver: Decision-making about and experiences with gastrostomy in amyotrophic lateral sclerosis

Interview guide with prompts.

Personal information:

Patient

Male/Female

Age:

Highest education:

Date diagnosis:

Type of feeding tube: PEG/PRG/other

Method of communication: verbal/non-verbal/verbal with communication aid

Caregiver

Male/Female

Age:

Highest education:

Relationship to patient:

Interview

1. To start off I would like to discuss the first time the topic of gastrostomy was first discussed with you. Can you remember this?
    a. Timing
    b. Response
    c. Did you have a notion what a feeding tube was?

2. I would also like to discuss your reasoning in deciding to accept or decline a feeding tube. Can you tell me how you came to this decision?
    a. Pros and cons
    b. Whose decision was it?
    c. Did you feel like you had a choice?
    d. Feelings surrounding the decision
    e. Differences between patient and caregiver

3. Can you tell me how the decision-making process proceeded and what you thought about it?
    a. Timing
    b. Information provision
    c. Role HCPs
    d. Role partner/family/caregiver
    e. Satisfaction with decision-making process

4. Looking back at the whole process, are there things you would have liked to do differently?
    a. Any regrets

If the feeding tube was accepted:

1. You chose to accept the feeding tube. I would like to ask you some follow-up questions about this. What are your experiences with the pros and cons of having a feeding tube?
    a. How do the pros compare to the cons?
    b. Did you expect this?
    c. Were you informed about this?
    d. What about the caregiver burden?
    e.

[The following questions are to be asked in private due to their sensitive nature]

Questions to be asked of the caregiver in private:

Introduction: Studies show that patients and their caregivers, partner or family sometimes have different opinions concerning the usefulness of interventions like the feeding tube. Some topics can also be sensitive. For these reasons I would like to ask you a few questions in private.

1. Mealtimes can be a heavy burden for caregivers. How did you experience mealtimes?

2. [if the feeding tube has been accepted] Did the burden of care surrounding mealtimes and feeding increase or decrease for you due to the placement of the feeding tube?

3. Cognitive changes in behavior or personality can occur during ALS and make the decision-making process more difficult. According to your experiences, have these kind of changes impacted the decision-making process about gastrostomy?

Questions to be asked of the patient in private:

Introduction: Studies show that patients and their caregivers, partner or family sometimes have different opinions concerning the usefulness of interventions like the feeding tube. Some topics can also be sensitive. For these reasons I would like to ask you a few questions in private.

1. For some patients caregiver burden can play a role in decision-making. Did this play a role for you in decision-making about gastrostomy?

2. Sometimes patients choose to accept interventions like a feeding tube due to pressure from their surroundings and not because it is their own decision. Did this play a role in your decision?

S2 File. Interview guide healthcare professionals

Interview guide with prompts on decision-making about and experiences with gastrostomy in amyotrophic lateral sclerosis.

Personal information:

Age:

Years of experience with ALS:

Type of feeding tube patient: PEG/PRG/other

Interview

Introduction: During this interview I would like to discuss the decision-making process about gastrostomy concerning one specific patient [name patient].

1. To start off, can you tell me when and how you first discussed the topic of gastrostomy with this patient?
    a. Response patient and caregiver
    b. Timing discussion

2. I would like to dive deeper into the decision-making process about gastrostomy. Can you tell me more about this?
    a. Timing
    b. Arguments HCP (for and against)
    c. Response patient/caregiver
    d. Arguments patient/caregiver (for and against)
    e. Coming to a decision

3. What roles did the different participants take in the decision-making process?
    a. Who made the decision?
    b. Choice (yes/no)
    c. Role and relationship of patient and caregiver
    d. Possible cognitive impairments and their impact

4. Adequate provision of information is crucial to allow patients to make a well-informed decision about a feeding tube. According to you, what role did the information provision play in the decision-making process?
    a. Quality of the information
    b. Acceptance of need of gastrostomy (patient and caregiver)

5. What was the final decision?
    a. Timing placement (early, late, too late)
    b. Deciding factor
    c. Satisfaction with decision-making process

S3 Table. COREQ checklist

Topic	Item No.	Guide questions/ description	Answer
Domain 1: Research team and reflexivity			
Personal characteristics			
Interviewer/facilitator	1	Which author/s conducted the interview or focus group?	Remko van Eenennaam and Neele Rave, see Methods – Data collection.
Credentials	2	What were the researcher's credentials? E.g. PhD, MD	See Table S2.
Occupation	3	What was their occupation at the time of the study?	See Table S2.
Gender	4	Was the researcher male or female?	Not relevant for this study.
Experience and training	5	What experience or training did the researcher have?	See Methods – Data collection.
Relationship with participants			
Relationship established	6	Was a relationship established prior to study commencement?	Participants were contacted by phone prior to the interview and informed about the study. The role of the interviewers was explained to participants. Other than that the interviewers were unknown to patients and caregivers. See Methods – Participants.
Participant knowledge of the interviewer	7	What did the participants know about the researcher? e.g.	As far as the patients and caregivers were concerned, no background knowledge of the interviewers was

		personal goals, reasons for doing the research	known to the participants, except for their role in the study. The background of the study was explained to participants. One interviewer (RvE) was known to two of the HCPs prior to them being interviewed. See Methods – Participants.
Interviewer characteristics	8	What characteristics were reported about the interviewer/facilitator? e.g. Bias, assumptions, reasons and interests in the research topic	Neither interviewer was involved in patient care. See Methods – Participants and table S2.
Domain 2: Study design			
Theoretical framework			
Methodological orientation and Theory	9	What methodological orientation was stated to underpin the study? e.g. grounded theory, discourse analysis, ethnography, phenomenology, content analysis	Interviews were analyzed using an inductive approach and categorized into overarching (sub)themes using thematic analysis. See Methods – Data analysis.
Participant selection			
Sampling	10	How were participants selected? e.g. purposive, convenience, consecutive, snowball	See Methods - Participants.
Method of approach	11	How were participants approached? e.g. face-to-face, telephone, mail, email	See Methods - Participants.

Sample size	12	How many participants were in the study?	See Results – Participants and Table 1.
Non-participation	13	How many people refused to participate or dropped out? Reasons?	None.
Setting			
Setting of data collection	14	Where was the data collected? e.g. home, clinic, workplace	Data was collected electronically via email, and telephone or video-consultation. See Methods – Data collection.
Presence of nonparticipants	15	Was anyone else present besides the participants and researchers?	During the interviews no one else was present except for the participants and the interviewers.
Description of sample	*16*	What are the important characteristics of the sample? e.g. demographic data, date	See Table 1.
Data collection			
Interview guide	17	Were questions, prompts, guides provided by the authors? Was it pilot tested?	The interview guide was not field tested.
Repeat interviews	18	Were repeat interviews carried out? If yes, how many?	No repeat interviews were conducted.
Audio/visual recording	19	Did the research use audio or visual recording to collect the data?	Yes, see Methods - Participants.
Field notes	20	Were field notes made during and/or after the interview or focus group?	Field notes were made during the interviews to support the interviewer. These were not analysed or

			recorded after the interview.
Duration	21	What was the duration of the inter views or focus group?	See Results – Participants.
Data saturation	22	Was data saturation discussed?	Yes, see Methods – Data analysis
Transcripts returned	23	Were transcripts returned to participants for comment and/or corrected?	Yes, see Methods – Data collection.
Domain 3: analysis and findings			
Data analysis			
Number of data coders	24	How many data coders coded the data?	Two (RvE and NR). See Methods – Data analysis.
Description of the coding tree	25	Did authors provide a description of the coding tree?	The coding tree is available (in Dutch) at request from the corresponding author.
Derivation of themes	26	Were themes identified in advance or derived from the data?	Themes were derived from the data. See Methods – Data analysis.
Software	27	What software, if applicable, was used to manage the data?	NVIVO 12. See Methods – Data analysis.
Participant checking	28	Did participants provide feedback on the findings?	No.
Reporting			
Quotations presented	29	Were participant quotations presented to illustrate the themes/findings? Was each quotation	Yes, see tables 2-5.

		identified? e.g. participant number	
Data and findings consistent	30	Was there consistency between the data presented and the findings?	Yes, see Tables 2-5 and Results section.
Clarity of major themes	31	Were major themes clearly presented in the findings?	Yes, see Tables 2-5 and Results section.
Clarity of minor themes	32	Is there a description of diverse cases or discussion of minor themes?	Yes, see Tables 2-5 and Results section.

S4 Table. Researcher credentials

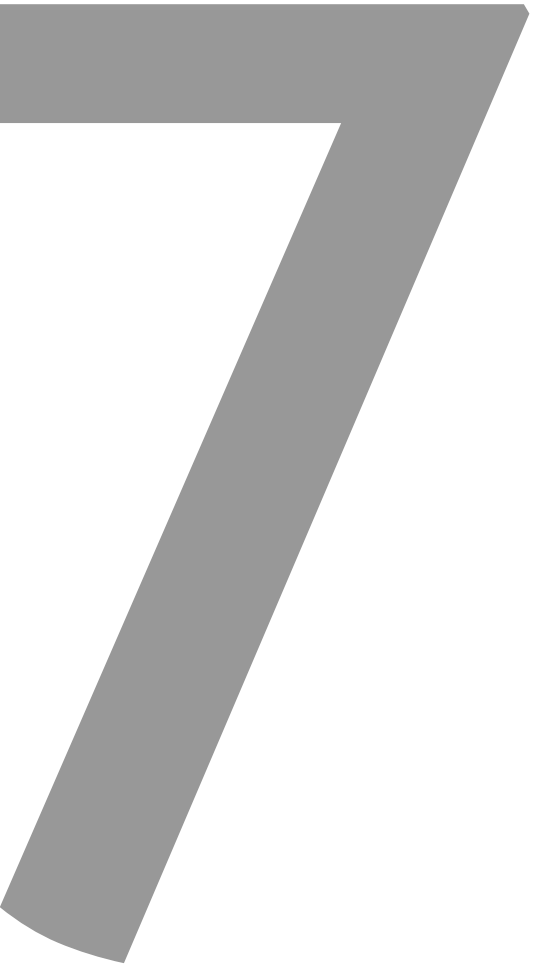
Name	Occupation
Remko M. van Eenennaam, MSc	Researcher (PhD-student)
Neele Rave, MSc	Researcher (PhD-student)
Willeke Kruithof, MD, PhD	Rehabilitation physician
Esther Kruitwagen-van Reenen, MD, PhD	Rehabilitation physician
Leonard H. van den Berg, MD, PhD	Neurologist
Anne Visser-Meily, MD, PhD	Rehabilitation physician
Anita Beelen, PhD	Senior researcher

PART

3

Deciding on End-of-life

CHAPTER



Frequencies in end-of-life practices and associated factors in patients with amyotrophic lateral sclerosis in the Netherlands: a population-based cohort survey study (2014-2016)

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Summary

Background

Amyotrophic lateral sclerosis is a progressive and lethal neurodegenerative disease that is at the forefront of debates on regulation of assisted dying. Since 2002, when euthanasia was legally regulated in the Netherlands, the frequency of this end-of-life practice has increased substantially from 1·7% in 1990 and 2005 to 4·5% in 2015. Our aim was to investigate whether the frequency of euthanasia in people with amyotrophic lateral sclerosis since 2002 has similarly increased and to investigate factors associated with end-of-life practices and the quality of end-of-life care in people with this disease.

Methods

We calculated the frequency of euthanasia in people with amyotrophic lateral sclerosis from to euthanasia review committees (ERC) between 2012 and 2020. We conducted a population-based survey of clinicians and informal caregivers of people with amyotrophic lateral sclerosis who died between 2014 and 2016 to assess factors associated with end-of-life decision-making and the quality of end-of-life care. Results were compared with those of clinic-based survey studies conducted in the period 1994–2005. End-of-life practices result from end-of-life decisions by a clinician where hastening of death is taken into account as a potential, likely or certain effect, and comprised euthanasia, physician-assisted suicide, ending of life without explicit request, forgoing life-prolonging treatment, and intensified alleviation of symptoms.

Findings

Between Jan 1, 2012, and Dec 31, 2020, 4130 reports of death from amyotrophic lateral sclerosis were made to ERCs, of which 1014 were from euthanasia or PAS (mean frequency 25% per year). Of 884 people with amyotrophic lateral sclerosis who died between Jan 1, 2014, and Dec 31, 2016, 731 clinicians and 741 caregivers were identified, of whom 356 (49%) and 450 (61%), respectively, were included in the population-based survey study. According to clinicians, end-of-life practices were chosen by 280 (79%) of 356 people who died due to amyotrophic lateral sclerosis. The frequency of euthanasia in people with amyotrophic lateral sclerosis in 2014–16 (40% [141 of 356 deaths due to amyotrophic lateral sclerosis]) was higher than in 1994–98 (17% [35 of 203]) and 2000–05 (16% [33 of 209]). Median survival of people with amyotrophic lateral sclerosis from diagnosis was 15·9 months (95% CI 12·6–17·6) for those who chose euthanasia and 16·1 months (13·4–19·1) for those who did not choose euthanasia (hazard ratio 1·07, 95% CI 0·85–1·34; p=0·58). According to caregivers, people with amyotrophic lateral sclerosis choosing euthanasia compared with other end-of-life practices more often reported the reasons to hasten death as no chance of improvement (56% [53 of 94] *vs* 39% [28 of 72]),

loss of dignity (50% [47 of 94] *vs* 21% [15 of 71]), dependency (36% [34 of 94] *vs* 7% [five of 71]), and fatigue or extreme weakness (44% [41 of 94] *vs* 20% [14 of 71]). According to caregivers, people with amyotrophic lateral sclerosis choosing euthanasia, and those not choosing euthanasia, were satisfied with the general quality (93% [83 of 89] *vs* 86% [73 of 85]) and availability (97% [85 of 88] *vs* 91% [81 of 90]) of end-of-life care.

Interpretation

The proportion of people with amyotrophic lateral sclerosis who choose euthanasia in the Netherlands has increased since 2002. The choice of euthanasia was not associated with disease or patient characteristics, depression or hopelessness, or the availability or quality of end-of-life care. The choice of euthanasia had no effect on overall survival. Future studies could focus on the effect on quality of life of discussing end-of-life options as part of multidisciplinary care throughout the course of the disease to reduce feelings of loss of autonomy and dignity in people living with amyotrophic lateral sclerosis.

Funding

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Glossary

End-of-life practices result from end-of-life decisions by a clinician where hastening of death is taken into account as a potential, likely or certain effect.[5,7] End-of-life practices include euthanasia, physician-assisted suicide, ending of life without explicit request by patient, forgoing life-prolonging treatment, and intensified alleviation of symptoms.

Assisted dying: death is hastened by a clinician at the explicit request of the patient, this includes euthanasia and physician-assisted suicide.

Euthanasia: clinicians reported that death was the result of the administration of drugs by a clinician with the explicit intention of hastening death at the patient's explicit request.

Physician-assisted suicide: clinicians reported death was the result of the patient taking drugs that were provided by a clinician with the explicit intention of enabling the patient to hasten their own death.

Ending of life without explicit request by patient: clinicians reported death was the result of the administration of drugs by a clinician with the explicit intention of hastening death without an explicit request of the patient.

Forgoing life-prolonging treatment: clinicians reported that they had withheld or withdrawn medical treatment while taking into account the possible hastening of death or with the explicit intention of hastening death.

Intensified alleviation of symptoms: clinicians reported that the alleviation of symptoms or pain were intensified while taking into account the possible hastening of death. It mostly concerns administration of opioids to patients who are in the last hours or days of life.

Continuous deep sedation: clinicians reported that the patient had been given medication to deeply and continuously sedate them until death. Continuous deep sedation can occur together with other end-of-life practices but is not considered an end-of-life practice because the goal of this process, according to the National guideline for Palliative Sedation in the Netherlands, is not to hasten death but to relieve suffering through lowering of consciousness. The guideline states that the life expectancy of a patient may not exceed 2 weeks at the moment continuous deep sedation is started.[23]

Introduction

The practice of assisted dying is an important ethical and public policy issue, and is the subject of increasing international discussion in many countries.[1,2] The 2022 Report of the Lancet Commission on the Value of Death recommended that "legislators considering the introduction of assisted dying should study the experience of where this practice has already been introduced".[3] In 2002, the Netherlands was the first country to legally regulate euthanasia and physician-assisted suicide (PAS), although these practices had been tolerated by the government during the 1980s and 1990s.[4] The 2002 regulation specified strict conditions for euthanasia and PAS, including a voluntary and well considered request by the patient, unbearable suffering without prospect of improvement, informing the patient about their situation and prospects, no reasonable alternative in the form of treatment, consulting a second independent clinician, exercising due medical care, and reporting to one of five regional euthanasia review committees (ERCs) for review.[5,6] Euthanasia, PAS, or both these end-of-life practices have since been legalised in Canada (2016), the USA (in the States of California, Colorado, Washington DC, Hawaii, New Jersey, and Maine; 2015–19), Australia (in the States of Victoria, Western Australia, and South Australia; 2017–19), New Zealand (2021), and Spain (2021).[1]

After the 2002 regulation of euthanasia and PAS in the Netherlands, national survey studies on end-of-life decision-making reported an increase in the nationwide rate of total end-of-life practices, from 39·4% in 1990 to 58·1% in 2015, and the frequency of euthanasia more than doubled from 1·7% in 1990 and 2005 to 4·5% in 2015.[7] In Belgium, where euthanasia has also been regulated since 2002, the frequency of reported euthanasia has also increased, as has the frequency of PAS in Switzerland and Oregon (USA).[9,10] However, the data from the Netherlands seem to be an overestimation when compared with the frequency of euthanasia reported to ERCs, as is mandatory by law, which increased from 1·4% in 2005 to 3·7% in 2015.[8–10] This overestimation is probably caused by the format of the survey, which does not ask directly whether euthanasia has taken place, but rather "whether the respondent had administered, supplied, or prescribed drugs with the explicit intention of hastening death, resulting in the patient's death".[5] Clinicians might answer this question in the affirmative in cases for which non-lethal drugs were used (eg, opioids) to provide symptom relief or sedation that might possibly have hastened death; there is no evidence of non-reporting of euthanasia to ERCs.[5,11]

People with amyotrophic lateral sclerosis, a progressive and lethal neurodegenerative disease, have regularly been at the forefront of debates regarding legalisation of euthanasia and PAS.[12–14] Neurological and neurodegenerative diseases are the second most frequently reported underlying disease—after cancer—of people choosing assisted

dying in the Netherlands, Oregon and Washington (USA), and parts of Canada.[15–18] Insights into the frequency of end-of-life practices over time, and associated demographic, disease, psychological, and care-related factors, reasons to hasten death, and the effect on overall survival in people with amyotrophic lateral sclerosis could help to inform international debate on end-of-life decision-making.[3] In previous survey studies in the Netherlands of cohorts with amyotrophic lateral sclerosis, from 1994–98 and 2000–05, the frequency of total end-of-life practices was stable during these periods, at 55–56%, including 16–17% euthanasia.[12,19] Euthanasia was legalised in the Netherlands in the middle of the 2000–05 cohort. However, the cohorts in these studies were clinic-based, rather than population-based, which might not be an accurate representation of the total population with amyotrophic lateral sclerosis. Studies in the Netherlands and Oregon and Washington (USA) of people with amyotrophic lateral sclerosis who have requested and been granted euthanasia or PAS found that a loss of autonomy and dignity was associated with the individual's choice.[17,19] Insufficient quality of end-of-life care has been suggested as a reason for the high frequency of euthanasia in people with amyotrophic lateral sclerosis in the Netherlands.[13]

Our aim was to study whether the frequency of euthanasia and other end-of-life practices in people with amyotrophic lateral sclerosis who died between 2014 and 2016 has increased in the Netherlands compared to 1994-2005, similar to national trends, as reflected by annual ERC reports[8] and national survey studies in the general population,[7] and which factors might be associated with end-of-life decision-making. We also aimed to investigate the quality of end-of-life care and the effect of euthanasia on overall survival.

Research in context

Evidence before this study

We searched PubMed without language restrictions using the terms (amyotrophic lateral sclerosis[MeSH Terms] OR motor neurone disease[MeSH Terms]) AND (euthanasia[MeSH Terms] OR assisted suicide[MeSH Terms] OR end of life care[MeSH Terms] OR right to die[MeSH Terms]) for articles on the frequency of end-of-life practices and euthanasia or physician-assisted suicide (PAS) in amyotrophic lateral sclerosis and associated factors. We found three studies, two of which were our previous studies on end-of-life practices in the Netherlands in cohorts with amyotrophic lateral sclerosis from 1994–98 and 2000–05. The third study was on PAS for people with amyotrophic lateral sclerosis in the US States of Washington and Oregon. All three studies were clinic-based rather than population-based. In the Netherlands, the frequency of euthanasia (16–17%) and total end-of-life practices (55–56%) was stable from 1994 to 2005, and the frequency of PAS was

3·4–6·7% in the two US States. In the 2000–05 cohort study from the Netherlands, an association between euthanasia and loss of autonomy and dignity was recorded, and a similar association with PAS was noted in Washington and Oregon.

Added value of this study

Our study uses reliable ERC-reported data, instead of survey-based data, to show the frequency of euthanasia in people with amyotrophic lateral sclerosis in the Netherlands. ERC-reported frequency of euthanasia was 25% in 2012–20, which is an increase from 16–17% in previous clinic-based survey studies from 1994–98 and 2000–05. Our study additionally assessed median survival from diagnosis in people who chose euthanasia compared with those not choosing euthanasia, and investigated disease and patient characteristics associated with the choice of euthanasia, and the quality of end-of-life care, using clinician and caregiver questionnaires.

Implications of all the available evidence

In our study, we showed that the proportion of people with amyotrophic lateral sclerosis choosing euthanasia in the Netherlands has increased since legalisation in 2002. Disease or patient characteristics, and depression or hopelessness, did not account for this increase. The choice of euthanasia appears to be an individual existential decision associated with feelings of loss of autonomy and dignity, according to caregivers. Furthermore, we showed that a high frequency of euthanasia in people with amyotrophic lateral sclerosis can co-occur with a high level of satisfaction with end-of-life care and without negatively affecting survival, indicating that the choice of euthanasia is typically made at the end-stage of the disease for most people.

Methods

Study design

We did a population-based survey study in the Netherlands, which was similar to previous clinic-based cohort studies done in 1994–98 and 2000–05.[12,19] Our cohort for this study included people who were diagnosed with amyotrophic lateral sclerosis and died between Jan 1, 2014, and Dec 31, 2016. Information about this cohort was obtained from the population-based Netherlands ALS registry.[20] We sent questionnaires to treating clinicians and caregivers of this cohort to obtain information about end-of-life practices, factors associated with end-of-life decisions, and the quality of end-of-life care. We compared data for the current cohort with those of previous cohorts (appendix 1 p 6-10).[12,19]

The Medical Ethical Committee of UMC Utrecht (Utrecht, Netherlands) approved the study protocol (appendix 2). Anonymity of clinicians, caregivers, and people with

amyotrophic lateral sclerosis was guaranteed because no identifying information was included in the questionnaire.

Procedures

We ascertained the number of cases of euthanasia and PAS between 2012 and 2020 in people with amyotrophic lateral sclerosis. We obtained this information from the annual reports of ERCs, according to the procedure described in the appendix (p 3). We used the population-based Netherlands ALS registry to identify people diagnosed with amyotrophic lateral sclerosis, according to revised El-Escorial criteria,[21] who died between 2014 and 2016. Patient characteristics at diagnosis that were retrieved from this registry included the amyotrophic lateral sclerosis functional rating scale revised (ALSFRS-R), the average monthly decline in functional status (ΔFRS), and survival from date of diagnosis (appendix p 3).

Starting in June, 2017, for every person with amyotrophic lateral sclerosis who had died between 2014 and 2016, we sent a questionnaire to their treating clinician and informal caregiver (usually the spouse or a child) with a request to complete and return the form. Several reminders were sent to non-responders, up until the end of 2018. Clinician and caregiver questionnaires were based on a format used in nationwide surveys of end-of-life decision-making in the Netherlands[5] and our previous cohort studies.[12,19] Instead of asking directly whether euthanasia or other end-of-life practices had occurred, the clinician questionnaire focused on end-of-life decision-making that might have preceded the death of the person involved. For example, clinicians were asked whether continuous deep sedation (CDS) had been used. Other questions included the need for interdisciplinary consultation on medical decisions, palliative care, disease status 2 weeks before death, and the presence of depression in the last phase of life. The caregiver questionnaire addressed the patient's social structure, feelings, religion, hopelessness, and three symptoms of depression (according to the Diagnostic and Statistical Manual for Mental Disorders,4th edn—ie, feeling depressed, diminished interest or pleasure, and feeling excessively guilty) not attributed to functional decline caused by the disease. Caregivers were also asked why patients may have wanted to hasten their death (irrespective of end-of-life practice) and whether the patient was satisfied with the quality of care during the last month before dying using a validated Dutch questionnaire to evaluate palliative health care.[22] These items were similar to our previous cohort study.[19]

End-of-life practices, which are defined in the panel, were classified using several key questions (appendix p 2, figure S1). If more than one end-of-life practice occurred, only the practice considered to have the greatest potential to affect the hastening of a patient's death was included in the analysis.[5] If the clinician reported the death as sudden and totally unexpected, it was classified as sudden unexpected death. If no end-of-life

decision had been made and the patient did not die unexpectedly, it was coded as no end-of-life practice. CDS was not classified as an end-of-life practice because the goal of this process, according to the national guideline for palliative sedation, is not to hasten death but to relieve suffering through lowering of consciousness.[23] Often, but not always, CDS occurs in conjunction with other end-of-life decisions. Any inconsistencies in reported end-of-life decisions were resolved by deliberation between the authors (RMvE, WK, MM, JV, LvdB).

Statistical analysis

To compare changes in euthanasia and PAS reported to the ERC to previous clinic-based cohort studies done in 1994–98 and 2000–05,[12,19] we calculated the frequency of euthanasia and PAS per year for all deaths, cancer, and neurological diseases (including amyotrophic lateral sclerosis) by dividing numbers of cases reported to the ERC by numbers of annual deaths reported to the central death registry of Statistics Netherlands.[10,24] Further details on the approach we used are described in the appendix (p 3).

To investigate differences in survival between people who chose euthanasia and those who did not (ie, other or no end-of-life practices), we used Kaplan-Meier analyses and Cox proportional hazards models. Survival of people with amyotrophic lateral sclerosis from diagnosis is highly variable, ranging from a few months to more than 10 years. Therefore, we did a sensitivity analysis to adjust for potential prognostic imbalances, including ENCALS risk profile as a covariate.[25,26] Details on the ENCALS risk profile are provided in the appendix (p. 3).

To evaluate possible selection bias, characteristics of individuals we included in this study were compared with those of people we did not include (appendix p 5). To evaluate the effect of time and regional differences on response rate, we compared the frequency of included clinician and caregiver questionnaires per year and per province where the patient was living at the time of death (appendix p 5).

Between cohort differences were explored using appropriate statistical tests to flag relevant patient characteristics. These tests should be interpreted with caution, as a non-significant differences do not provide evidence of absence. To determine whether patient characteristics or disease-related factors, and quality of end-of-life care, were associated with choosing euthanasia, we compared the group of patients choosing euthanasia with those not choosing euthanasia (this group included people foregoing life-prolonging treatment, intensified alleviation of symptoms, and no end-of-life practices). Patients who died unexpectedly were not included in the analyses because they could have made a proactive decision in favour of either euthanasia, other end-of-life practices, or no end-of-life practices, had they not died unexpectedly. Chi-squared tests were used to compare

the group choosing euthanasia versus those not choosing euthanasia. Fisher's exact test was used when cells had a frequency of five or less, whereas continuous variables were analysed using the Mann-Whitney test. Missing data were not imputed. All analyses were conducted in R (version 4.0.3).

Role of the funding source

The funders of the study had no role in study design, data collection, data analysis, data interpretation, or writing of the report.

Results

Between Jan 1, 2012, and Dec 31, 2020, a total of 1014 cases of euthanasia and PAS in people with amyotrophic lateral sclerosis were reported to the ERC and an estimated 4130 people died of amyotrophic lateral sclerosis. The mean frequency of euthanasia and PAS was 25% per year (range 18% [90 of 496] in 2012 and 29% [136 of 476] in 2019; figure 1). The proportion of people with amyotrophic lateral sclerosis choosing euthanasia was much higher compared with ERC-reported euthanasia and PAS in the general population, in cases of cancer, and in all neurological diseases (including amyotrophic lateral sclerosis; figure 1).

884 patients with amyotrophic lateral sclerosis died between Jan 1, 2014 and Dec 31, 2016. A flowchart of included clinician and caregiver questionnaires is provided in the appendix (p 4, figure S2). For 731 patients, their treating clinician was identified and sent a questionnaire; for 384 (53%) patients clinicians agreed to participate, and in 356 questionnaires an end-of-life practice could be established (49% of total). No clinically important differences were noted in baseline characteristics between patients included in our cohort (n=356) and those not included (n=528; appendix p 5). For 741 patients, a caregiver was identified, of whom 450 (61%) agreed to participate. 73% (329 of 450) of caregivers were the spouse or partner, and 19% (86 of 450) a child of the patient. In 211 cases, both a clinician report on end-of-life decision-making and a caregiver report was available. See appendix (p 5) for differences in response rate in clinician and caregiver questionnaires.

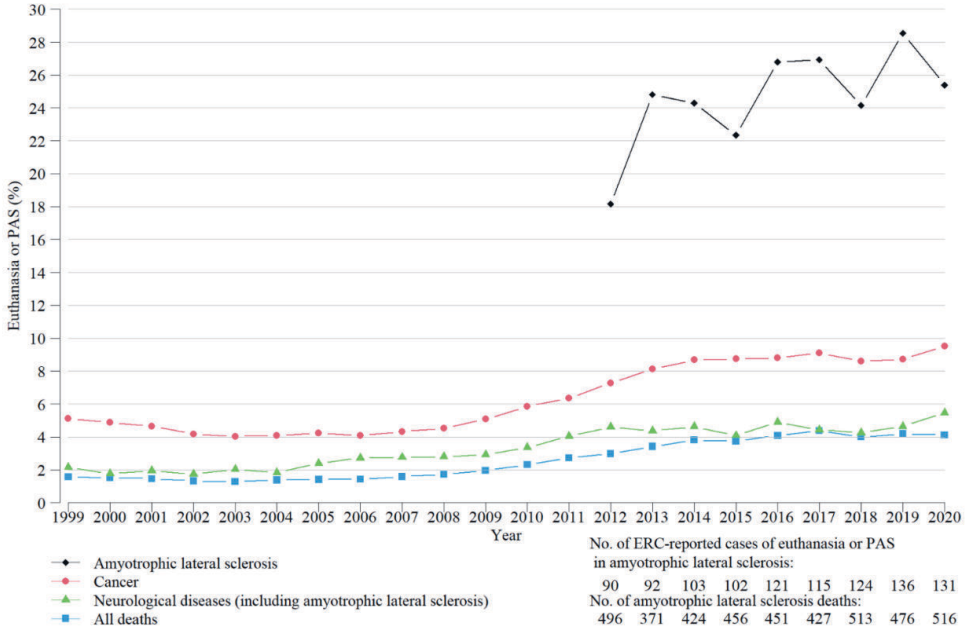

Figure 1: **Frequency of euthanasia or physician-assisted suicide reported to ERCs in the Netherlands**

The frequency of ERC-reported euthanasia or PAS as proportion of all deaths, in cancer, neurological diseases (including amyotrophic lateral sclerosis), and amyotrophic lateral sclerosis. Total numbers of cases of euthanasia or PAS for all deaths and major causes of death (e.g. cancer and all neurological disease) are based on the annual reports of the ERC which go back to 1999.[10] Total number of cases of euthanasia for amyotrophic lateral sclerosis are only known for the period 2012-2020. Total number of deaths in amyotrophic lateral sclerosis are estimated per year by dividing the number of ERC-reported cases of euthanasia or PAS by the number of amyotrophic lateral sclerosis deaths, which we estimated to be between the number of population-based motor neuron disease deaths and the distribution of amyotrophic lateral sclerosis deaths compared to primary muscular atrophy or primary lateral sclerosis, as registered in the Netherlands population-based ALS registry (see appendix 1 p 3).[20] These are divided by the numbers of annual deaths reported to the central death registry of Statistics Netherlands.[24] Amyotrophic lateral sclerosis deaths are part of all deaths, but are only approximately 0·2-0·4% of 140.000-160.000 total deaths in the Netherlands per year. ERC = euthanasia review committees; PAS = physician-assisted suicide.

Based on clinician questionnaires, end-of-life practices occurred for 280 (79%) of 356 patients (table 1). Of these, 141 (40%) chose euthanasia, a significant increase compared with the cohort from 1994–98 (17% [35 of 203]) and 2000–05 (16% [33 of 209]; table 1). In 2014-2016, other end-of-life practices were 24% (85 of 356) foregoing life-prolonging treatment and 15% (54 of 356) intensified alleviation of symptoms (table 1). No cases of PAS or ending of life without explicit request were reported. In 11% (39 of 356) of cases, death was sudden and unexpected, and in 10% (37 of 356) of cases, no end-of-life practices were reported. In 22% (79 of 356), physicians reported that the patient was continuously deeply sedated. CDS occurred in conjunction with euthanasia in 3% (10 of 356), foregoing life-prolonging treatment in 12% (44 of 356), intensified alleviation of symptoms in 6% (21 of 356), and no end-of-life practices in 1% (4 of 356) of patients.

Kaplan-Meier analysis (figure 2) showed that median survival from diagnosis did not differ for the euthanasia group (15·9 months, 95% CI 12·6-17·6) or no euthanasia group (16·1 months, 13·4-19·1; HR 1·07, 95% CI 0·85-1·34, $p = 0·58$). The rate of death for people not choosing euthanasia was slightly higher between approximately 6 and 12 months (although the curve remained within the 95% CI for the group choosing euthanasia), and higher for people choosing euthanasia after approximately 22 months. No difference between those choosing euthanasia compared to those not choosing euthanasia was noted after adjusting for ENCALS risk profile (adjusted HR 1·10, 95% CI 0·87-1·39, $p = 0·43$). Regardless whether they did or did not choose euthanasia, the ENCALS risk profile was associated with survival in our cohort (HR 1·43, 95% CI 1·29-1·57, $p < 0·0001$).

Patients who chose euthanasia were younger, were more often more highly educated, and less often confined to bed than those not choosing euthanasia (table 2). According to clinicians, patients choosing euthanasia had more often expressed a wish to hasten death at some time compared to the no euthanasia group (table 3). Clinicians and caregivers did not report any items on depression/hopelessness to be associated with the choice for euthanasia. According to caregivers, people with amyotrophic lateral sclerosis choosing euthanasia compared with other end-of-life practices reported no chance of improvement (56% [53 of 94] vs 39% [28 of 72]), loss of dignity (50% [47 of 94] vs 21% [15 of 71]), dependency (36% [34 of 94] vs 7% [five of 71]), and fatigue or extreme weakness (44% [41 of 94] vs 20% [14 of 71]) as reasons to hasten their death (table 3).

	1994-2005		2014-2016	p value
	1994-1998[12]	**2000-2005**[19]		
Number of included clinician questionnaires (%)	**203/241 (84%)**	**209/273 (75%)**	**356/731 (49%)**	
Unexpected sudden death	37/203 (18%)	38/209 (18%)	39/356 (11%)	0·007
No end-of-life practices	54/203 (27%)	54/209 (26%)	37/356 (10%)	< 0·0001
Most important end-of-life practice				
Euthanasia	35/203 (17%)	33/209 (16%)	141/356 (40%)	< 0·0001
Physician-assisted suicide	6/203 (3%)	2/209 (1%)	0	0·022
Ending of life without explicit request by patient	2/203 (1%)	0	0	0·544
Foregoing life-prolonging treatment	21/203 (10%)	26/209 (13%)	85/356 (24%)	< 0·0001
Intensified alleviation of symptoms α	48/203 (24%)	56/209 (27%)	54/356 (15%)	0·001
Total end-of-life practices performed	112/203 (55%)	117/209 (56%)	280/356 (79%)	< 0·0001

Data are number (%). End-of-life practices are classified based on clinician-reported end-of-life decisions. p value for differences between combined cohorts 1994-1998[12] and 2000-2005[19] versus our 2014-2016 cohort.

Table 1: Frequencies of end-of-life practices, no end-of-life practices and unexpected sudden deaths (1994-2016)

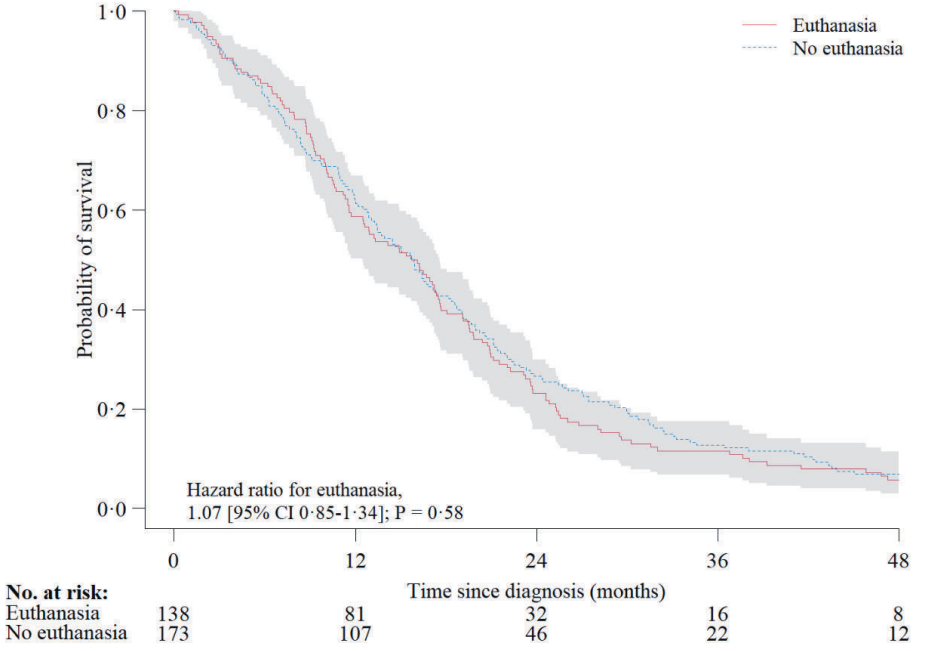

Figure 2: Kaplan-Meier survival curves for people with amyotrophic lateral sclerosis choosing euthanasia compared to those not choosing euthanasia

Euthanasia (n = 138) versus no euthanasia (n = 150) which consisted of people with amyotrophic lateral sclerosis foregoing life-prolonging treatment and intensified alleviation of symptoms (n = 114), and no end-of-life practices (n = 36); six cases were excluded because date of onset was missing (three of these six chose euthanasia and three did not) and all cases of unexpected sudden deaths (n = 64) were excluded.

Demographic characteristics, Netherlands ALS Center registry	**Euthanasia (n = 141)**	**No euthanasia (n = 176)**	**p value**
Age at onset (years), median (IQR)	63·6 (55·5, 69·0)	65·2 (59·7, 72·9)	0·042
Sex, female	58/141 (41%)	72/176 (41)%	> 0·99
Demographic characteristics, according to caregiver α	**Euthanasia (n = 95)**	**No euthanasia (n = 94)**	**p value**
Married	86/95 (90%)	84/93 (90%)	> 0·99
Children	77/93 (83%)	80/94 (85%)	0·817
Religion important to patient	28/89 (32%)	25/87 (29%)	0·818
Education			0·026
Low	5/94 (5%)	9/92 (10%)	
Intermediate	53/94 (56%)	64/92 (70%)	
High	36/94 (38%)	19/92 (21%)	
Disease characteristics last two weeks before death, acc. clinician β	**Euthanasia (n = 141)**	**No euthanasia (n = 176)**	**p value**
Tracheotomy	5/140 (4%)	6/176 (3%)	> 0·99
Tube feeding	68/137 (50%)	70/171 (41%)	0·158
Able to speak	72/133 (54%)	99/164 (60%)	0·336
Arm function			0·567
Able to raise hands to mouth	52/132 (39%)	67/148 (45%)	
Unable to reach mouth	45/132 (34%)	48/148 (32%)	
Paralysis arms	35/132 (27%)	33/148 (22%)	
Leg function			0·035
Walk unsupported	16/118 (14%)	12/154 (8%)	
Walk supported	20/118 (17%)	30/154 (19%)	
Dependent on wheelchair	47/118 (40%)	44/154 (29%)	
Confined to bed	35/118 (30%)	68/154 (44%)	

Data are median (IQR) or % and based on: Netherlands ALS registry, or α caregiver questionnaires of cases in which clinicians reported end-of-life decision-making, β clinician questionnaires of cases in which clinicians reported end-of-life decision-making. Other end-of-life practices are foregoing life-prolonging treatments and intense alleviation of symptoms. ALS = amyotrophic lateral sclerosis; IQR = interquartile range. p value for differences between patients choosing euthanasia versus patients not choosing euthanasia (i.e. life-prolonging treatments, intense alleviation of symptoms, and no end-of-life practices); all cases of unexpected sudden deaths were excluded since no end-of-life decision could be made.

Table 2: **Demographic and disease characteristics**

Wish to hasten death and depression, according to clinician α	**All clinician questionnaires (n = 356)**	**Euthanasia (n = 141)**	**No euthanasia (n = 176)**	**p value**
Had at some time expressed a wish to hasten death	251/348 (72%)	139/141 (99%)	98/170 (58%)	< 0·0001
Use of antidepressants in end stage	24/348 (7%)	5/138 (4%)	15/172 (9%)	0·102
Depression during end stage	46/350 (13%)	10/140 (7%)	25/173 (14%)	0·063
Depression or hopelessness, according to caregiver β	**All caregiver questionnaires (n = 450)**	**Euthanasia (n = 95)**	**No euthanasia (n = 94)**	**p value**
Feeling hopeless	217/371 (59%)	48/84 (57%)	44/77 (57%)	> 0·99
History of depression	47/445 (11%)	9/92 (10%)	16/93 (17%)	0·207
DSM-IV items, according to caregiver				
Diminished interest or pleasure	91/367 (25%)	16/84 (19%)	16/75 (21%)	0·872
Feeling depressed	125/368 (34%)	22/84 (26%)	30/75 (40%)	0·092
Feeling excessively guilty	22/365 (6%)	5/84 (6%)	7/74 (10%)	0·550
Reasons to hasten death, according to caregiver ¶	**All caregiver questionnaires (n = 168)**	**Euthanasia (n = 95)**	**Other end-of-life practices (n = 73)**	**p value**
No chance of improvement	81/166 (49%)	53/94 (56%)	28/72 (39%)	0·038
Fear of suffocation	77/165 (47%)	49/93 (53%)	28/72 (39%)	0·109
Loss of dignity	62/165 (38%)	47/94 (50%)	15/71 (21%)	< 0·0002
Dependency	39/165 (24%)	34/94 (36%)	5/71 (7%)	< 0·0001
Feeling a burden on family or friends	24/165 (15%)	18/94 (19%)	6/71 (8%)	0·088
Fatigue/extreme weakness	55/165 (33%)	41/94 (44%)	14/71 (20%)	0·002
Pain	17/165 (10%)	16/94 (17%)	1/71 (1%)	0·001

Data are % and based on: α clinician questionnaires of cases in which clinicians reported end-of-life decision-making, β caregiver questionnaires of cases in which clinicians reported end-of-life decision-making, or ¶ caregiver questionnaires in which euthanasia or other end-of-life practices (ie life-prolonging treatments and intense alleviation of symptoms) had occurred according to the clinician. DSM-IV = diagnostic and statistical manual of mental disorders. p value for differences between patients choosing euthanasia versus patients not choosing euthanasia (i.e. life-prolonging treatments, intense alleviation of symptoms, and no end-of-life practices). All cases of unexpected sudden deaths were excluded since no end-of-life decision could be made; for reasons to hasten death all cases of no end-of-life practices were also excluded since people with amyotrophic lateral sclerosis had not decided to hasten death in these cases.

Table 3: **Wish to hasten death, depression, hopelessness, and reasons to hasten death**

Quality of care during the last month, according to caregiver	**All caregiver questionnaires (n = 450)**	**Euthanasia (n = 95)**	**No euthanasia (n = 94)**	**p value**
General quality of health care sufficient	373/420 (89%)	83/89 (93%)	73/85 (86%)	0·178
General availability of health care sufficient	383/423 (91%)	85/88 (97%)	81/90 (91%)	0·212
Sufficient information to ease suffering	389/402 (97%)	91/91 (100%)	78/82 (95%)	0·049
Adequate financial reimbursement	280/416 (67%)	66/88 (75%)	48/81 (59%)	0·044
Sufficient aids and appliances	322/427 (75%)	68/90 (76%)	68/85 (80%)	0·600
Health care providers provided sufficient mental support	333/357 (93%)	77/79 (98%)	71/77 (92%)	0·164
Health care providers relieved physical symptoms sufficiently	350/404 (87%)	74/86 (86%)	79/88 (90%)	0·602
Health care providers had sufficient experience and knowledge to help	388/423 (92%)	84/92 (91%)	82/90 (91%)	> 0·99
Patient had sufficient confidence in health care providers	407/427 (95%)	93/95 (98%)	83/89 (93%)	0·158
Health care providers should have taken a larger role in the care	54/439 (12%)	8/93 (9%)	8/92 (9%)	> 0·99

Data are %. p value for differences between patients choosing euthanasia versus patients not choosing euthanasia (i.e. life-prolonging treatments, intense alleviation of symptoms, and no end-of-life practices); all cases of unexpected sudden deaths and no end-of-life practices were excluded since no end-of-life decision could be made.

Table 4: **Quality of end-of-life care**

Discussion

Based on survey-reported data from people with amyotrophic lateral sclerosis in the Netherlands who died between 2014 and 2016 (40%), and cases reported to ERCs between 2012 and 2020 (25%), the proportion of people with amyotrophic lateral sclerosis in the Netherlands who chose euthanasia has increased substantially compared to 1994-2005 surveys (16-17%).[12,19] Our survey shows that people with amyotrophic lateral sclerosis choosing euthanasia did not differ in disease or patient characteristics, or depression/hopelessness from those not choosing euthanasia. Importantly, the quality and availability of end-of-life care, which is complex and multidisciplinary in amyotrophic lateral sclerosis, appeared to have been better in people with amyotrophic lateral sclerosis who died after choosing euthanasia than in those who did not choose euthanasia according to their caregivers. As a result, a healthcare-related reason for the increase in euthanasia over time and the relatively high rate of euthanasia in people with amyotrophic lateral sclerosis is unlikely. Individuals who chose euthanasia were somewhat younger and more highly educated, and, according to caregivers, the reasons for hastening death mentioned more often were no chance of improvement, loss of dignity, and dependency compared to other end-of-life practices. Rather, the choice for euthanasia is an individual, existential decision associated with feelings of loss of autonomy and dignity. Survival from diagnosis was similar in individuals who decided on euthanasia compared to other or no end-of-life practices, indicating that euthanasia occurs at a similar, late disease stage as death in people with other or no end-of-life practices. These findings suggest that a high frequency of euthanasia can occur together with a high level of satisfaction with end-of-life care and without negatively impacting survival.

Our data show that the frequency of ERC-reported euthanasia is lower compared to that based on our survey in our 2014-2016 cohort, confirming the latter may be an overestimation. This is similar to national survey studies, on which our survey is based, in which one in five cases was incorrectly classified as euthanasia, but was probably CDS or alleviation of symptoms using non-lethal drugs (e.g. opioids).[5,11] Furthermore, clinicians opposed to euthanasia may have been more reluctant to participate in the survey.[27] Despite the risk of overestimation, we kept the same questionnaire items because they allowed us to compare our findings to those of our previous amyotrophic lateral sclerosis studies and national studies, while providing insight into factors associated with euthanasia and other end-of-life practices.[5,7,12,19] Compared to 1994-2005, the frequency of euthanasia in amyotrophic lateral sclerosis has increased; based on ERC-reported data, our most reliable estimate, one in four people dying from amyotrophic lateral sclerosis between 2012 and 2020 chose euthanasia.

The increase in euthanasia in amyotrophic lateral sclerosis is in line with upward national trends of euthanasia in the Netherlands and Belgium, and PAS in Switzerland and Oregon (USA).[8,9] It is not clear what the explanation is for this increase in the Netherlands,[28] but traditionally there has been broad support for euthanasia amongst the general public and healthcare professionals.[29] The aging population – i.e. older people are more likely to request euthanasia than younger people – and declining religiosity offer possible explanations.[7,27] These factors might also partially account for the increase in euthanasia in amyotrophic lateral sclerosis in our 2014-2016 cohort, which is older and less religious compared to cohorts in previous studies (see appendix p 7, table S3).[12,19] Another explanation is the increase in attention for palliative care, emphasizing quality of end-of-life, prevention and alleviation of suffering, and patient autonomy. Palliative care resources have increased significantly between 2005 and 2012.[30] Adequate and accessible care are pre-conditions for euthanasia to be an autonomous choice and ethical end-of-life option.[6] It has been suggested that poor quality and lack of availability of palliative care may have contributed to the high frequency of euthanasia in amyotrophic lateral sclerosis in our 1994-1998 study.[12,13] However, similar to our 2000-2005 study and a prospective study,[19,31] we did not find an association between satisfaction with the quality of end-of-life care and a choice for euthanasia; on the contrary, they increased simultaneously (see appendix, table S6). Income has been shown to be associated with geographical variation in euthanasia in the Netherlands,[27] but this does not appear to be the case in our study, since individuals choosing euthanasia were more often satisfied with financial reimbursement of care compared to those not choosing euthanasia. The concurrent increase in euthanasia and satisfaction with the quality of end-of-life care can be explained by the increased attention for palliative care in the Netherlands and availability of multidisciplinary care in amyotrophic lateral sclerosis.[30,32]

Similar to 2000-2005,[19] loss of dignity and dependency, but not feeling one is a burden, were frequently mentioned as reasons to hasten death for individuals choosing euthanasia. The same was found for people with amyotrophic lateral sclerosis choosing PAS in Oregon and Washington (USA).[17] Loss of dignity at end-of-life may be more often related to distress in amyotrophic lateral sclerosis compared to other patient groups.[33] Overall, patient, disease-, or end-of-life-characteristics, or depression/hopelessness do not explain the choice for euthanasia. The choice for euthanasia and PAS in amyotrophic lateral sclerosis appears to be an individual, existential decision – i.e. connected to death, autonomy, self-determination, connectedness, meaning –[34,35] in which loss of dignity and increased dependency frequently play a role.

Our data show that euthanasia occurs much more frequently in amyotrophic lateral sclerosis in the Netherlands compared to all deaths, cancer, and all neurological diseases. In Oregon and Washington (USA) and Canada, neurodegenerative diseases, most

commonly amyotrophic lateral sclerosis, are also the second most frequently reported underlying disease in people choosing euthanasia/PAS.[1618] Due to the nature of their disease, people with amyotrophic lateral sclerosis are probably more likely to want to control the circumstances of their dying.[36] Almost one in four in our cohort chose to forego life-prolonging treatment, an increase compared to 1994-2005, suggesting that some people consider this an acceptable alternative to euthanasia.[36] No cases of PAS were reported for our 2014-2016 cohort. Legalization of both euthanasia and PAS has resulted in very few people choosing PAS in the Netherlands and Belgium.[7,9] Moreover, ingesting or injecting a lethal drug can be problematic, even impossible, in a progressive disease like amyotrophic lateral sclerosis, due to loss of hand function and swallowing capacity.[36] Thus, patient autonomy and self-determination over their manner of dying may be limited when countries only allow PAS and not euthanasia, especially in a progressive disease like amyotrophic lateral sclerosis.

By definition, actively hastening death through euthanasia/PAS or foregoing life-prolonging treatment shorten survival. Individuals choosing euthanasia had a slightly lower rate of death between 6 and 12 months. This may be because the legal process of preparing for euthanasia takes time, and during this period, those people with a very poor prognosis may pass away. Overall, our study shows that individuals choosing euthanasia do not have a shorter survival compared to those choosing other end-of-life practices or no end-of-life practices. Nor did they differ in disease characteristics two weeks before death, except that individuals choosing euthanasia were less often confined to bed, but this might be explained by the lower frequency of CDS in this group. This suggests that euthanasia in amyotrophic lateral sclerosis in the Netherlands occurs at an advanced, terminal stage of the disease comparable to death in individuals not choosing euthanasia.[12] This also explains why, despite the increased frequency of euthanasia, survival in 2014-2016 was not shorter compared to 1994-2005 (see appendix, table S2).[12,19] Survival in our cohort is shorter compared to a recent prospective population-based cohort study[20] as in our survey study only people with amyotrophic lateral sclerosis who died were included and analyzed. Legalization of euthanasia, even at a high frequency as shown in our study, does not appear to cause a substantial reduction in survival time in amyotrophic lateral sclerosis.

In a recent report, the Lancet Commission on the Value of Death emphasized the importance of acknowledging that death is not merely physiological but also a social, psychological, and spiritual event in which palliative care and honest, open discussion of death and the manner of dying are crucial.[3] Despite palliative care aimed at comfort and maximizing quality of life, people with amyotrophic lateral sclerosis may develop a wish to hasten death.[37] Faced with the prospect of total loss of control over the body, including speech, discussing assisted dying alongside other end-of-life options can help people with

amyotrophic lateral sclerosis regain autonomy and self-determination over the timing, manner, and circumstances of dying when life has become unbearable.[38]

An important strength of our study is a more reliable insight into the frequency of euthanasia in amyotrophic lateral sclerosis over a long period in the Netherlands, using ERC-reported data instead of only survey-based data which are likely to result in an overestimation. Another strength is our analysis of the impact of choice for euthanasia on survival. Finally, our population-based cohort results in a more accurate estimation of end-of-life practices, associated factors, and quality of end-of-life care compared to previous clinic-based studies.[12,19] A limitation of our study is the retrospective nature and caregivers serving as patients' proxies which can result in recall bias, but this does allow valuable insight into patient reasoning about end-of-life decision-making which is lacking from national studies.[5,7] These limitations would be overcome by a prospective study similar to one we conducted which confirmed many of the results of our previous 1994-98 and 2000-05 retrospective survey studies.[31] Another limitation is the low inclusion rate of clinicians and possible participation bias as clinicians opposed to euthanasia may have been more reluctant to participate.[27] And clinicians of people who died longer ago were less likely to participate. Nevertheless, because our cohort is population- rather than clinic-based, the total number of included clinician questionnaires has increased compared to our previous survey studies. The absence of cognitive and behavioral profiling, and the use of non-invasive ventilation are also a limitation, because both can play an important role in end-of-life decision-making in amyotrophic lateral sclerosis. The relevance of our study may be limited to western countries where autonomy and personal choice play a larger role in healthcare and end-of-life decision-making compared to non-western countries. A final limitation is that the people with amyotrophic lateral sclerosis in our survey died between seven and nine years ago. However, we think our findings are still relevant today for the discussion on assisted dying in the Netherlands and other countries, because multidisciplinary amyotrophic lateral sclerosis care – including the role of palliative care – is still organized in the same way, no legal changes concerning euthanasia have occurred, and there have been no great advances in finding a cure or treatment.

In conclusion, the proportion of patients with amyotrophic lateral sclerosis choosing euthanasia has increased compared to 1994-2005. Patients choosing euthanasia did not differ in disease or patient characteristics, depression/hopelessness , or availability and quality of end-of-life care compared to those not choosing euthanasia. Euthanasia occurs at a similar, late disease stage as death in patients not choosing euthanasia. A high frequency of euthanasia can occur together with a high level of satisfaction with end-of-life care without negatively impacting survival.

Contributors

JV, LB, and LvdB were responsible for the study design. LB collected the data with help from JB. RMvE did the literature search and created the figures. RMvE analysed the data with help from WK, MM, and RPAvE. All authors contributed to the interpretation of the results. RMvE, WK, and AB wrote the original draft of the manuscript and JV, MM, LB, RPAvE, JB, JVM, and LvdB reviewed and critically revised the manuscript. RMvE, AB, WK, JV, AVM, and LvdB had full access to all the data in the study. AB, WK, JV, and LvdB verified the underlying data. All authors approved the final version for submission and accept responsibility for submitting for publication.

Declaration of competing interests

We declare no competing interests.

Data sharing

Underlying data can be requested from the corresponding author.

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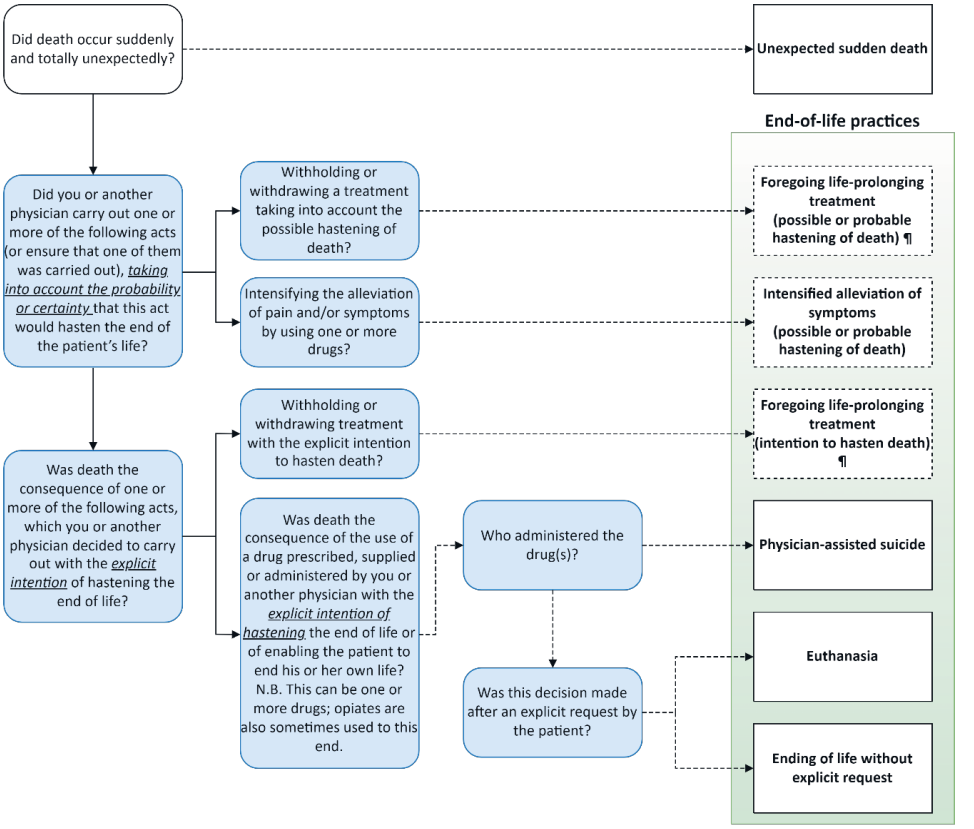
Appendix 1: Supplemental information

Table of contents

Part I. Classification of end-of-life practices



Supplementary Figure S1: Classification scheme of end-of-life practices based on clinician-reported end-of-life decisions

The clinician questionnaire contained multiple items on end-of-life decision-making based on items in national survey studies.[1] Regardless of the answers to previous questions, all those connected by the solid arrows had to be answered. End-of-life practices were coded based on a series of key questions (solid blue). Multiple end-of-life practices (green box on the far right) could occur in conjunction with each other (i.e. except for physician-assisted suicide, euthanasia, and ending of life without request which are mutually exclusive to each other). If more than one end-of-life practice was reported, only the practice involving the most explicit intention to hasten the patient's death was included in the analysis; this intention increases from top to bottom. If the intention was similar, the administration of drugs prevailed over the withholding or withdrawing of treatment. ¶ Foregoing life-prolonging treatment can occur taking into account the possible or probable hastening of death, or with the explicit intention to hasten death. These are classified together as foregoing life-prolonging treatment.

Part II. Methods

II.1 Number of cases of euthanasia in amyotrophic lateral sclerosis reported to euthanasia review committees

Since November 1998, clinicians in the Netherlands are required to report any cases of euthanasia or physician-assisted suicide(PAS) to one of five regional euthanasia review committees (ERCs) and these cases are, after review, registered centrally.[2-3] Annual reports from the ERCs list the total number of reported cases of euthanasia or PAS for the general population and specified per major cause of death.[2] Although these annual reports contain the number of cases of euthanasia for all neurological diseases, which includes amyotrophic lateral sclerosis, the numbers of cases of amyotrophic lateral

sclerosis are not specified. At our request, the ERCs reviewed all reported cases of euthanasia or PAS in neurological disorders to determine the exact frequency of euthanasia or PAS in amyotrophic lateral sclerosis; they were able to determine this for the period 2012-2020.

II.2 Patient characteristics

The amyotrophic lateral sclerosis functional rating scale revised (ALSFRS-R) contains 12 items, each with a minimum of 0 (no function) and a maximum score of 4 (no disability). Item scores are summarised to give a total score ranging from 0 to 48 in which higher scores are better and reflective of less disability. The average monthly decline in functional status (ΔFRS) was calculated from symptom onset to diagnosis by taking the ALSFRS-R at diagnosis minus 48, divided by symptom duration in months (i.e. date of diagnosis minus date of symptom onset). Survival, defined as time to death from any cause, was determined from date of diagnosis.

II.3 Calculation of total number of deaths from amyotrophic lateral sclerosis

Statistics Netherlands does not register amyotrophic lateral sclerosis separately as a cause of death. A recent study reports the number of observed deaths due to motor neuron disease, the most common of which is amyotrophic lateral sclerosis, but also includes progressive muscular atrophy and primary lateral sclerosis.[4] It is difficult, however, to distinguish between amyotrophic lateral sclerosis and progressive muscular atrophy, meaning it is likely that the latter is registered as amyotrophic lateral sclerosis.[5] The Netherlands population-based ALS registry does contain exact numbers of annual amyotrophic lateral sclerosis, progressive muscular atrophy, and primary lateral sclerosis deaths, but only covers 72% of all people with motor neuron disease. We used the ALS registry to determine the distribution of amyotrophic lateral sclerosis deaths, compared to progressive muscular atrophy and primary lateral sclerosis deaths, in motor neuron disease.[4] We estimated the actual number of amyotrophic lateral sclerosis deaths, therefore, to be between all registered motor neuron disease deaths (i.e. upper limit of 100%) and the incidence of amyotrophic lateral sclerosis deaths (i.e. lower limit of 81·1-87·1%) compared to progressive muscular atrophy and primary lateral sclerosis, as registered in the Netherlands population-based ALS registry. The frequency euthanasia or physician-assisted suicide (PAS) reported to euthanasia review committees (ERCs) is number of ERC-reported cases of euthanasia or PAS divided by estimated number of amyotrophic lateral sclerosis deaths:

$$\frac{\text{Number of ERC-reported cases of euthanasia or PAS}}{\text{Number of motor neuron disease deaths} * (1 + \text{incidence of amyotrophic lateral sclerosis deaths in Netherlands ALS registry})/2} * 100$$

.

That the percentage of people with amyotrophic lateral sclerosis in reported motor neuron disease deaths had to be estimated from annual data from our national ALS registry might also be a limitation of our study.[4] However, all patients in the ALS registry have been diagnosed by professionals specializing in motor neurone diseases and we consider the diagnoses based on the ALS registry to be accurate, which accounts for the diagnoses of ALS, PMA and PLS from the onset of national ALS registry in 2006. We,

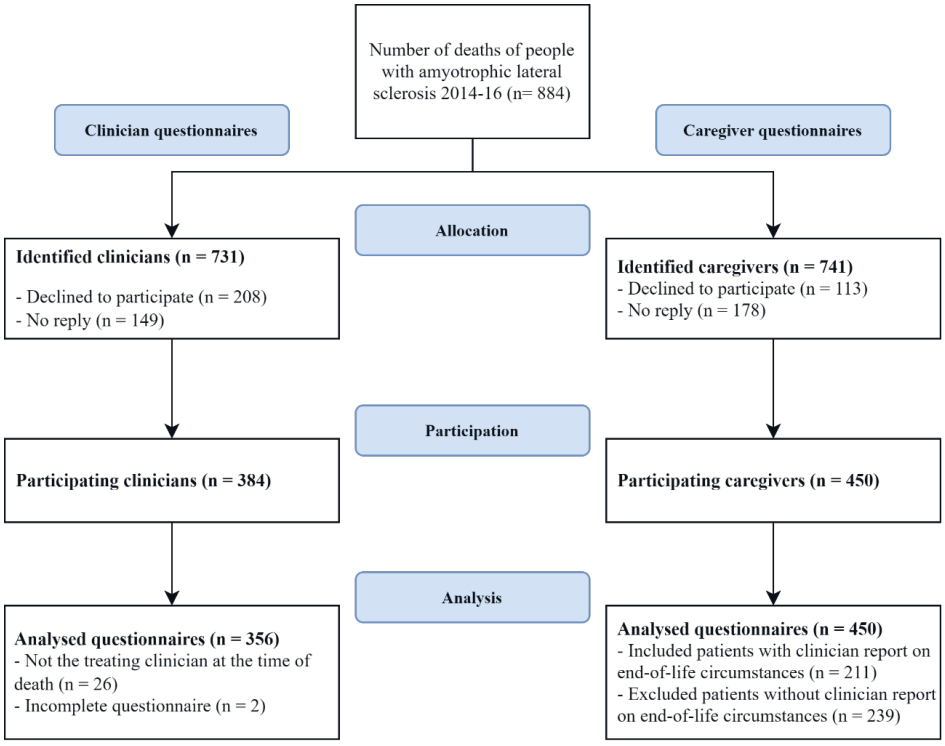
therefore, consider the potential impact of misclassification, based on the findings on end-of-life practices reported in our paper, to be minor.

II.4 Description of ENCALS risk profile

The ENCALS risk profile is a single score based on a cross-validated prediction model that summarises eight prognostic factors (age at onset, bulbar onset, *C9orf72*, definite amyotrophic lateral sclerosis, diagnostic delay, forced vital capacity at diagnosis, frontotemporal dementia, and progression rate at diagnosis) for people with amyotrophic lateral sclerosis.[6]

Part III. Inclusion 2014-16 cohort

III.1 Flowchart of included questionnaires 2014-16 cohort



Supplementary Figure S2:Flow chart of included clinician and caregiver questionnaires

884 people with amyotrophic lateral sclerosis were registered in the Netherlands ALS Center registry as having died between Jan 1, 2014, and Dec 31, 2016. Of these 884 people with amyotrophic lateral sclerosis, 731 clinicians and 741 caregivers were identified and sent a questionnaire.

III.2 Investigation of possible selection bias in baseline characteristics of included people with amyotrophic lateral sclerosis

	All people with amyotrophic lateral sclerosis who died between 2014 and 2016	**Included people with amyotrophic lateral sclerosis**	**Excluded people with amyotrophic lateral sclerosis**	**p value**
	(n = 884)	**(n = 356)**	**(n = 528)**	
Sex, female	382/884 (43%)	140/356 (39%)	242/528 (46%)	0·065
Age at onset (years)	65·1 (58·3, 71·8)	64·1 (57·7, 70·5)	66·0 (58·8, 72·5)	0·031
Diagnostic delay (months)	9·0 (5·7, 14·1)	8·8 (5·6, 12·8)	9·4 (5·8-15·0)	0·173
ΔFRS at diagnosis (per month)	-0·9 (-1·6, -0·5)	-0·8 (-1·5, -·04)	-0·9 (-1·7, -0·5)	0·326
FVC (% of predicted)	89 (72, 103)	90 (75, 103)	88 (69, 103)	0·147
Familial ALS	51/689 (7%)	18/295 (6%)	33/394 (8%)	0·327
Bulbar onset	263/741 (36%)	106/308 (34%)	157/433 (36%)	0·797
Definite ALS (El Escorial)	167/719 (23%)	65/301 (22%)	102/418 (24%)	0·430
FTD at diagnosis	32/377 (9%)	8/140 (5%)	24/229 (10%)	0·124
Survival from diagnosis (months)	16·2 (8·4, 27·2)	15·9 (8·7, 24·9)	16·4 (8·1, 28·9)	0·087

Data are median (IQR) or number (%). ALS = amyotrophic lateral sclerosis; ΔFRS = decline in functional status: (ALS Functional Rating Scale–Revised score – 48) / (disease duration); FTD = frontotemporal dementia; FVC = forced vital capacity; IQR = interquartile range. p value for differences in patient characteristics between included people with amyotrophic lateral sclerosis (with physician report on end-of-life circumstances) versus excluded people with amyotrophic lateral sclerosis (without physician report of end-of-life circumstances).

Supplementary Table S1: **Patient characteristics of people with amyotrophic lateral sclerosis who died between 2014 and 2016**

III.3 Investigation of possible differences in response rate of clinician and caregiver questionnaires

The inclusion rate of clinician questionnaires was 40% (92 of 231) in 2014, 51% (125 of 247) in 2015, and 55% (139 of 253) in 2016 (p = 0·003). This rate did not differ per province (p = 0·854 The response rate of caregivers did not differ per year (p = 0·366) or per province (p = 0·296).

Part IV Comparison between 2014-16 cohort versus 1994-98 and 2000-05 cohorts

To study trends in end-of-life practices, associated factors, and quality of end-of-life care, a comparison was made between our 2014-16 cohort and previous cohort studies in people with amyotrophic lateral sclerosis who died between 1994 and 1999[7] and between 2000 and 2006.[8] In the 1994-1998 cohort study, clinicians of 203 deceased people with amyotrophic lateral sclerosis (response 84%) completed questionnaires on circumstances at the end of life; caregivers were not sent questionnaires. In the 2000-2005 cohort study, clinicians of 209 people with amyotrophic lateral sclerosis (response 75%) and caregivers of 198 people with amyotrophic lateral sclerosis (80%) completed questionnaires on circumstances at the end of life.

IV.1 Comparison of patient characteristics (1994-2016)

	1994-2005		**2014-2016**	
	1994-1998 (*n* = 203)[7]	**2000-2005 (*n* = 209)**[8]	**2014-2016 (*n* = 356)**	**p value**
Sex, female	84/203 (41%)	79/209 (38%)	140/356 (39%)	> 0·99
Age at onset (years)	58·9 (51·3,67·3)	62·4 (55·6, 68·0)	64·1 (57·7, 70·5)	< 0·0001
FVC (% of predicted)	··	84·5 (66·5, 97)	90 (75, 103)	0·008
Familial ALS	11/203 (5%)	11/209 (5%)	18/295 (6%)	0·869
Bulbar onset	62/203 (31%)	74/209 (35%)	106/308 (34%)	0·012
Survival since onset (months)	29·1 (20·1, 43·1)	27·9 (19·1, 40·3)	25·6 (17·7, 40·2)	0·645

Data are median (IQR) or number (%). ALS = amyotrophic lateral sclerosis; FVC = forced vital capacity; IQR = interquartile range. p value for differences between 1994-1998[7] and 2000-2005[8] cohorts versus 2014-2016 cohort (present study).

Supplementary Table S2: **Comparison of patient characteristics of people with amyotrophic lateral sclerosis (1994-2016)**

IV.2 Trends in demographic and disease characteristics (1994-2016)

	Euthanasia or PAS			
	1994-2005		**2014-2016**	**p value**
Demographic characteristics, Netherlands ALS Centre registry	**1994-1998 (*n* = 41)**[7]	**2000-2005 (*n* = 35)**[8]	**2014-2016 (*n* = 141)**	
Age at onset (years), median (IQR)	59·1 (51·7, 63·4)	60·8 (53·2, 68·3)	63·6 (55·5, 69·0)	0·044
Sex, female	23/41 (56%)	13/35 (37%)	58/141 (41%)	0·459
	1994-1998 (*n* = 41)[7]	**2000-2005 (*n* = 30)**[8]	**2014-2016 (*n* = 95)**	
Demographic characteristics, according to caregiver α				
Married	34/41 (83%)	24/29 (83%)	86/95 (90%)	0·221
Children	36/40 (90%)	25/30 (83%)	77/93 (83%)	0·587
Religion important to patient	13/31 (42%)	9/29 (31%)	28/89 (32%)	0·629
Education				0·950
Low	2/35 (6%)	1/29 (3%)	5/94 (5%)	
Intermediate	15/35 (43%)	20/29 (69%)	53/94 (56%)	
High	18/35 (51%)	8/29 (28%)	36/94 (38%)	
Disease characteristics last two weeks before death, acc. to clinician β	**1994-1998 (*n* = 41)**[7]	**2000-2005 (*n* = 35)**[8]	**2014-2016 (*n* = 141)**	
Tracheotomy	3/41 (7%)	1/35 (3%)	5/140 (4%)	0·812
Tube feeding	14/36 (39%)	13/35 (37%)	68/137 (50%)	0·148
Able to speak	20/40 (50%)	16/35 (46%)	72/133 (54%)	0·480
Arm function				0·569
Able to raise hands to mouth	10/38 (26%)	13/34 (38%)	52/132 (39%)	
Unable to reach mouth	16/38 (42%)	11/34 (32%)	45/132 (34%)	
Paralysis arms	12/38 (32%)	10/34 (29%)	35/132 (27%)	
Leg function				0·017
Walk unsupported	3/41 (7%)	2/35 (6%)	16/118 (14%)	
Walk supported	3/41 (7%)	3/35 (9%)	20/118 (17%)	
Dependent on wheelchair	12/41 (29%)	15/35 (43%)	47/118 (40%)	
Confined to bed	23/41 (56%)	15/35 (43%)	35/118 (30%)	
Supplementary Table S3: **Trends in demographic and disease characteristics (1994-2016)**				

	Other or no end-of-life practices			
	1994-2005		**2014-2016**	**p value**
Demographic characteristics, Netherlands ALS Centre registry	**1994-1998 (*n* = 125)**[7]	**2000-2005 (*n* = 136)**[8]	**2014-2016 (*n* = 176)**	
Age at onset (years), median (IQR)	59·0 (51·0, 67·4)	62·4 (56·6, 67·3)	65·2 (59·7, 72·9)	< 0·0001
Sex, female	52/125 (42%)	50/136 (37%)	72/176 (41)%	0·777
Demographic characteristics, according to caregiver α	**1994-1998 (*n* = 125)**[7]	**2000-2005 (*n* = 90)**[8]	**2014-2016 (*n* = 94)**	
Married	111/124 (90%)	71/90 (80%)	84/93 (90%)	0·334
Children	107/123 (87%)	79/90 (88%)	80/94 (85%)	0·731
Religion important to patient	65/93 (70%)	48/88 (55%)	25/87 (29%)	< 0·0001
Education				0·070
Low	12/108 (11%)	15/89 (17%)	9/92 (10%)	
Intermediate	54/108 (50%)	55/89 (62%)	64/92 (70%)	
High	42/108 (39%)	19/89 (21%)	19/92 (21%)	
Disease characteristics last two weeks before death, according to clinician β	**1994-1998 (*n* = 125)**[7]	**2000-2005 (*n* = 136)**[8]	**2014-2016 (*n* = 176)**	
Tracheotomy	3/124 (2%)	4/132 (3%)	6/176 (3%)	0·907
Tube feeding	57/122 (47%)	65/132 (49%)	70/171 (41%)	0·180
Able to speak	66/124 (53%)	61/130 (47%)	99/164 (60%)	0·048
Arm function				0·720
Able to raise hands to mouth	48/115 (42%)	45/110 (41%)	67/148 (45%)	
Unable to reach mouth	42/115 (37%)	39/110 (35%)	48/148 (32%)	
Paralysis arms	25/115 (22%)	26/110 (24%)	33/148 (22%)	
Leg function				0·256
Walk unsupported	4/124 (3%)	11/133 (8%)	12/154 (8%)	
Walk supported	22/124 (18%)	23/133 (17%)	30/154 (19%)	
Dependent on wheelchair	28/124 (23%)	30/133 (23%)	44/154 (29%)	
Confined to bed	70/124 (56%)	69/133 (52%)	68/154 (44%)	

Data are median (IQR) or % and based on: Netherlands ALS registry, α caregiver questionnaires of cases in which clinicians reported end-of-life decision-making (except for 1994-1998 cohort which were all based on clinician questionnaires), or β clinician questionnaires of cases in which clinicians reported end-of-life decision-making. Other end-of-life practices are foregoing life-prolonging treatments and intense alleviation of symptoms. All cases of unexpected sudden deaths were excluded since no end-of-life decision could be made. ALS = amyotrophic lateral sclerosis; IQR = interquartile range; PAS = physician-assisted death. p value for differences between 1994-1998[7] and 2000-2005[8] cohorts versus 2014-2016 cohort.

Supplementary Table S3: **Trends in demographic and disease characteristics (1994-2016) (cont.)**

IV.3 Trends in the wish to hasten death and depression/hopelessness (2000-2016)

	All clinician questionnaires		
	2000-2005 (*n* = 209)[8]	**2014-2016 (*n* = 356)**	**p value**
Wish to hasten death and depression, according to clinician α			
Had at some time expressed a wish to hasten death	106/209 (51%)	251/348 (72%)	< 0·0001
Use of antidepressants in end stage	19/203 (9%)	24/348 (7%)	0·382
Depression during end stage	29/208 (14%)	46/350 (13%)	0·889
	2000-2005 (*n* = 198)[8]	**2014-2016 (*n* = 450)**	
Depression/hopelessness, according to caregiver β			
Feeling hopeless	95/197 (48%)	217/371 (59%)	0·024
History of depression	15/195 (8%)	47/445 (11%)	0·325
DSM-IV items, according to caregiver			
Diminished interest or pleasure	38/197 (19%)	91/367 (25%)	0·168
Feeling depressed	43/196 (22%)	125/368 (34%)	0·004
Feeling excessively guilty	14/197 (7%)	22/365 (6%)	0·750
Supplementary Table S4: **Trends in the wish to hasten death and pression/hopelessness (2000-2016)**			

	Euthanasia or PAS			**Other or no end-of-life practices**		
	2000-2005 (*n* = 35)[8]	**2014-2016 (*n* = 141)**	**p value**	**2000-2005 (*n* = 136)**[8]	**2014-2016 (*n* = 176)**	**p value**
Wish to hasten death and depression, acc to clinician α						
Had at some time expressed a wish to hasten death	35/35 (100%)	139/141 (99%)	> 0·99	59/136 (43%)	98/170 (58%)	0·018
Use of anti-depressants in end stage	4/34 (12%)	5/138 (4%)	0·077	14/134 (10%)	15/172 (9%)	0·753
Depression during end stage	4/35 (11%)	10/140 (7%)	0·484	21/135 (16%)	25/173 (14%)	0·913
	2000-2005 (*n* = 30)[8]	**2014-2016 (*n* = 95)**		**2000-2005 (*n* = 90)**[8]	**2014-2016 (*n* = 94)**	
Depression /hopelessness, acc to caregiver β						
Feeling hopeless	18/30 (60%)	48/84 (57%)	0·955	41/90 (46%)	44/77 (57%)	0·181
History of depression	5/29 (17%)	9/92 (10%)	0·320	5/88 (6%)	16/93 (17%)	0·020
DSM-IV items, according to caregiver						
Diminished interest or pleasure	7/30 (23%)	16/84 (19%)	0·813	18/90 (20%)	16/75 (21%)	0·986
Feeling depressed	6/29 (21%)	22/84 (26%)	0·732	18/90 (20%)	30/75 (40%)	0·008
Feeling excessively guilty	4/30 (13%)	5/84 (6%)	0·240	6/90 (7%)	7/74 (10%)	0·713

Data are % and based on: α clinician questionnaires of cases in which clinicians reported end-of-life decision-making, or β caregiver questionnaires of cases in which clinicians reported end-of-life decision-making. Data not available for 1994-1998 cohort. Other end-of-life practices are: foregoing life-prolonging treatments and intense alleviation of symptoms. All cases of unexpected sudden deaths were excluded since no end-of-life decision could be made. DSM-IV = diagnostic and statistical manual of mental disorders; PAS = physician-assisted death. p value for differences between 2000-2005[8] versus 2014-2016 cohorts.

Supplementary Table S4: **Trends in the wish to hasten death and depression/hopelessness (2000-2016) (cont.)**

IV.4 Trends in reasons to hasten death (2000-2016)

	All caregiver questionnaires		
	2000-2005 (*n* = 90)[8]	**2014-2016 (*n* = 168)**	**p value**
Reasons to hasten death, according to caregiver			
No chance of improvement	35/90 (39%)	81/166 (49%)	0·165
Fear of suffocation	47/90 (52%)	77/165 (47%)	0·473
Loss of dignity	32/90 (36%)	62/165 (38%)	0·854
Dependency	17/90 (18%)	39/165 (24%)	0·473
Feeling a burden on family or friends	15/90 (17%)	24/165 (15%)	0·789
Fatigue/extreme weakness	13/90 (14%)	55/165 (33%)	0·002
Pain	1/90 (1%)	17/165 (10%)	0·004
Supplementary Table S5: **Trends in reasons to hasten death (2000-2016)**			

	Euthanasia or PAS			**Other or no end-of-life practices**		
	2000-2005 (*n* = 30)[8]	**2014-2016 (*n* = 95)**	**p value**	**2000-2005 (*n* = 60)[8]**	**2014-2016 (*n* = 73)**	**p value**
Reasons to hasten death, according to caregiver						
No chance of improvement	19/30 (63%)	53/94 (56%)	0·646	16/60 (27%)	28/72 (39%)	0·194
Fear of suffocation	21/30 (70%)	49/93 (53%)	0·146	26/60 (43%)	28/72 (39%)	0·734
Loss of dignity	16/30 (53%)	47/94 (50%)	0·914	16/60 (27%)	15/71 (21%)	0·591
Dependency	11/30 (37%)	34/94 (36%)	> 0·99	6/60 (10%)	5/71 (7%)	0·753
Feeling a burden on family or friends	6/30 (20%)	18/94 (19%)	> 0·99	9/60 (15%)	6/71 (8%)	0·369
Fatigue/extreme weakness	9/30 (30%)	41/94 (44%)	0·267	4/60 (6%)	14/71 (20%)	0·041
Pain	0/30 (0)	16/94 (17%)	0·012	1/60 (2%)	1/71 (1%)	> 0·99

Data are %. Data not available for 1994-1998 cohort. All cases of unexpected sudden deaths and no end-of-life practices were excluded since people with amyotrophic lateral sclerosis had not decided to hasten death in these cases. PAS = physician-assisted death. p value for differences between 2000-2005[8] versus 2014-2016 cohorts.

Supplementary Table S5: **Trends in reasons to hasten death (2000-2016) (cont.)**

IV.5 Trends in quality of end-of-life care (2000-2016)

	All caregiver questionnaires		
	2000-2005 (*n* = 198)[8]	**2014-2016 (*n* = 450)**	**p value**
Quality of care during the last month, according to caregiver			
General quality of health care sufficient	175/194 (90%)	373/420 (89%)	0·704
General availability of health care sufficient	177/197 (90%)	383/423 (91%)	0·899
Sufficient information to ease suffering	166/184 (90%)	389/402 (97%)	0·002
Adequate financial reimbursement	160/188 (85%)	280/416 (67%)	< 0·0001
Sufficient aids and appliances	141/190 (74%)	322/427 (75%)	0·828
Health care providers provided sufficient mental support	117/147 (80%)	333/357 (93%)	< 0·0001
Health care providers relieved physical symptoms sufficiently	136/178 (76%)	350/404 (87%)	0·003
Health care providers had sufficient experience and knowledge to help	123/185 (66%)	388/423 (92%)	< 0·0001
Patient had sufficient confidence in health care providers	133/187 (71%)	407/427 (95%)	< 0·0001
Health care providers should have taken a larger role in the care	21/194 (11%)	54/439 (12%)	0·692
Supplementary Table S6: **Trends in quality of end-of-life care (2000-2016)**			

	Euthanasia or PAS			**Other or no end-of-life practices**		
	2000-2005 (*n* = 30)[8] α	**2014-2016 (*n* = 95) α**	**p value**	**2000-2005 (*n* = 90)[8] α**	**2014-2016 (*n* = 94) α**	**p value**
Quality of care during the last month, according to caregiver						
General quality of health care sufficient	26/30 (87%)	83/89 (93%)	0·269	82/87 (94%)	73/85 (86%)	0·113
General availability of health care sufficient	27/30 (90%)	85/88 (97%)	0·171	84/89 (94%)	81/90 (91%)	0·565
Sufficient information to ease suffering	26/28 (93%)	91/91 (100%)	0·054	77/83 (93%)	78/82 (95%)	0·746
Adequate financial reimbursement	25/29 (86%)	66/88 (75%)	0·303	79/85 (93%)	48/81 (59%)	< 0·0001
Sufficient aids and appliances	22/27 (81%)	68/90 (76%)	0·611	67/88 (76%)	68/85 (80%)	0·667
Health care providers provided sufficient mental support	16/20 (80%)	77/79 (98%)	0·014	59/70 (84%)	71/77 (92%)	0·214
Health care providers relieved physical symptoms sufficiently	22/29 (76%)	74/86 (86%)	0·323	64/85 (75%)	79/88 (90%)	0·021
Health care providers had sufficient experience and knowledge to help	21/30 (70%)	84/92 (91%)	0·009	55/83 (66%)	82/90 (91%)	0·0001
Patient had sufficient confidence in health care providers	18/30 (60%)	93/95 (98%)	< 0·0001	61/86 (71%)	83/89 (93%)	0·0002
Health care providers should have taken a larger role in the care	1/30 (3%)	8/93 (9%)	0·452	6/88 (7%)	8/92 (9%)	0·848

Data are %. Other end-of-life practices are foregoing life-prolonging treatments and intense alleviation of symptoms. Data not available for 1994-1998 cohort. Other end-of-life practices are: foregoing life-prolonging treatments and intense alleviation of symptoms. All cases of unexpected sudden deaths were excluded since no end-of-life decision could be made. PAS = physician-assisted death. p value for trends between 2000-2005[8] and 2014-2016 cohorts.

Supplementary Table S6: **Trends in quality of end-of-life care (2000-2016) (cont.)**

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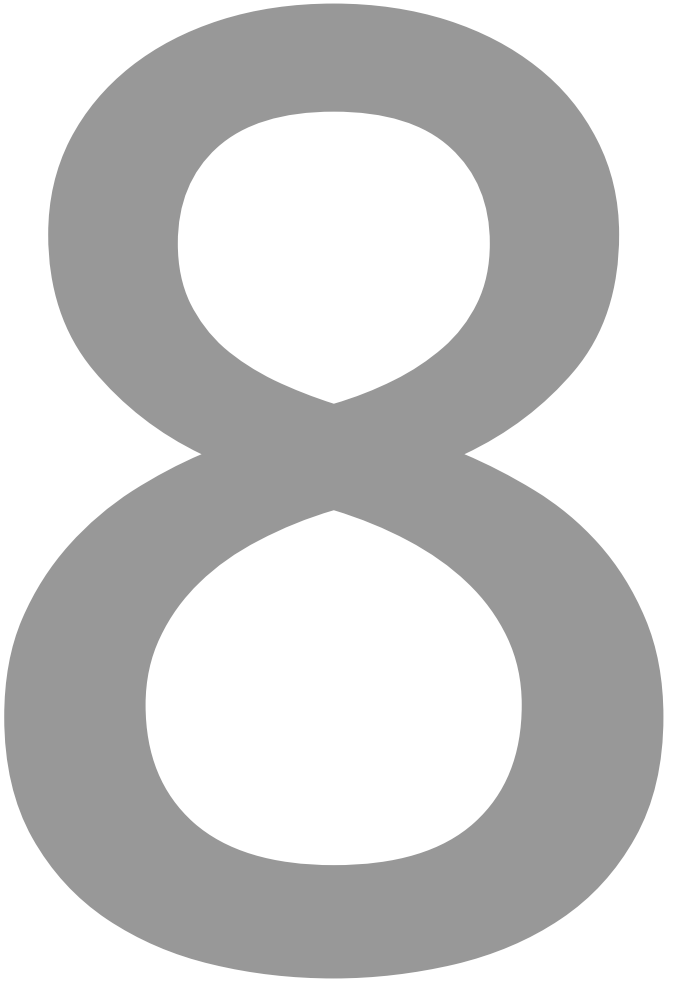
CHAPTER



Multidisciplinary end-of-life care for a patient with amyotrophic lateral sclerosis requesting euthanasia

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Lancet, (accepted July 2023)

A 68-year-old man diagnosed with amyotrophic lateral sclerosis (ALS) was referred to our specialised team. The patient had noticed increasing difficulty speaking and swallowing, followed by excessive weight loss and sialorrhea, for 1 year prior to the diagnosis. A feeding tube had been inserted to support nutritional intake 2 weeks after the patient had first been diagnosed.

During the following months, treatment was delivered by our multidisciplinary team comprising a

rehabilitation physician, occupational therapist, physiotherapist, speech therapist, dietician, psychologist, social worker, and spiritual counsellor, according to international ALS care guidelines.

The aim was optimizing quality of life through symptom management and psychological support. The ability to communicate and management of sialorrhea were the patient's priority - both relevant for continued social interaction—something he considered important in contributing to his quality of life. The sialorrhea was initially managed with glycopyrrolate and dextromethorphan combined with quinidine and, then with botulinum toxin A injections into saliva glands. As the disease progressed, a second injection of botulinum failed to adequately relieve his symptoms; the patient decided against radiotherapy of the salivary glands, the next line of treatment.

Simultaneously, the ALS-care team provided (psychological) support to reduce patient's and partner's struggle with the impact of ALS. Six months after being diagnosed, his general practitioner started also regular conversations with the patient about his values in life, his needs and goals considering the progressive course of his disease (advance care planning). End-of-life practices were mentioned to find out if they were on the same page in terms of options and wishes, but not discussed in detail at that stage.

Nine months after being diagnosed, the patient developed progressive weakness in his hands; he reported that the symptom burden of dysphagia, excessive sialorrhea, and uncontrollable coughing was exhausting.

Ten months after being diagnosed, the patient's respiratory function had decreased to a point where options for respiratory support had to be discussed; he agreed to nocturnal non-invasive ventilation (NIV) to reduce symptom burden. Continuous, invasive—through a tracheostoma—ventilation, had been discussed before starting NIV as an alternative to NIV, but the patient felt that this was not in line with his view of being and wanting to remain an autonomous, independent person.

Thirteen months after being diagnosed, he started to contemplate how his life would end; he had become increasingly desperate about having to let go of his loved ones. The patient attended sessions with the spiritual counsellor, accompanied by his wife, to enable him to come to terms with the last phase of his life with dignity.

Fourteen months after being diagnosed, the patient spoke to his general practitioner and requested euthanasia. An independent physician was consulted to confirm that the patient's request was voluntary and well-considered, and to substantiate that there was unbearable suffering without the prospect of improvement. The request was also discussed between general practitioner and the ALS-care team. The patient died peacefully, in the presence of his family and general practitioner, fifteen months after being diagnosed with ALS.

Contributors

WK, EKR, and LB were responsible for the study design. EKR and WK collected the data. RE and WK created the figure. WK and LB wrote the original draft of the manuscript and all authors reviewed and critically revised the manuscript. All authors approved the final version for submission. Written consent for publication was obtained from the patient's partner.

Declaration of interests

We declare no competing interests.

Role of the funding source

No funding organisation was involved in the writing of this manuscript.

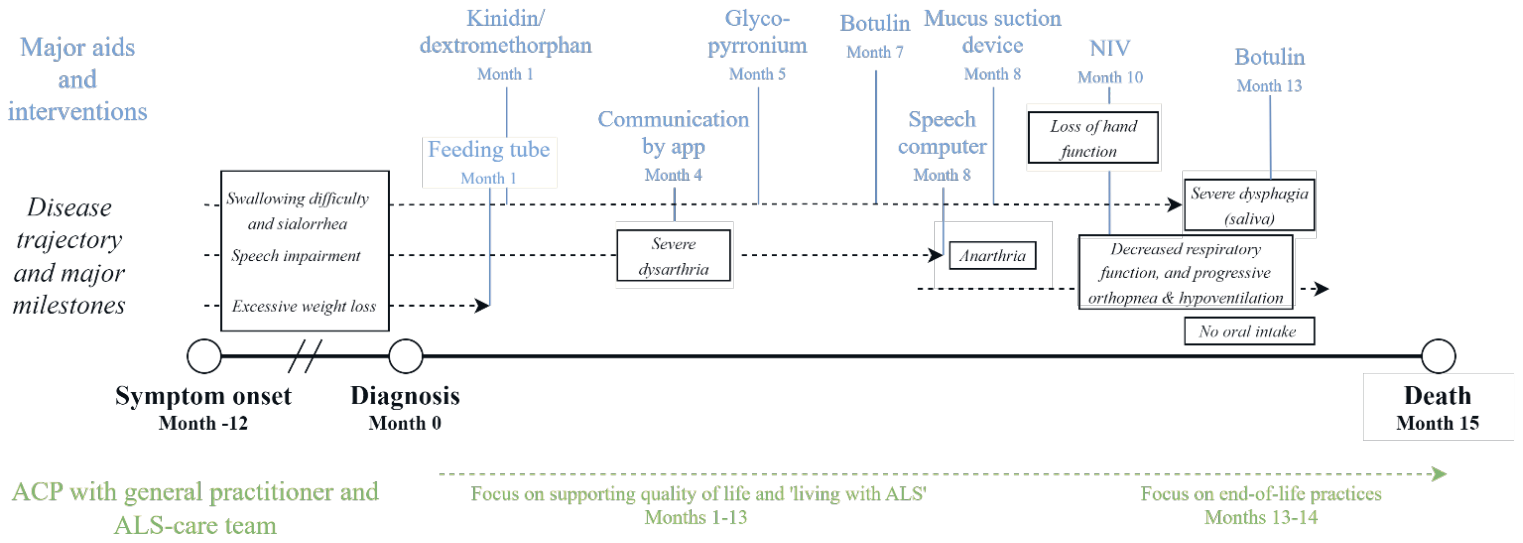

Figure: Summary of patient's disease trajectory and associated care
Multidisciplinary ALS care was provided by a team which included a rehabilitation physician, physiotherapist, occupational therapist, speech therapist, dietician, social worker, psychologist, and spiritual counsellor. ACP = advance care planning; ALS = amyotrophic lateral sclerosis; NIV = non-invasive ventilation.

CHAPTER

9

General discussion

From the start of their journey until the end, people with amyotrophic lateral sclerosis (ALS) are faced with many difficult, ethically complex, and often time-sensitive decisions about their future. This thesis explores the decision-making process about their healthcare from the perspective of people with ALS, their caregivers, and healthcare professionals (HCPs). HCPs have the difficult but rewarding task of finding a balance between the ethical principles of beneficence and patient autonomy, while supporting people with ALS on their journey and in these decision-making processes (1). The studies in this thesis provide HCPs with information that will allow them to offer **person-centered care** that supports the **autonomy and control** of people with ALS by **personalizing information** to individual needs and preferences, **promoting patient choice**, and **involving family caregivers** (Figure 1).

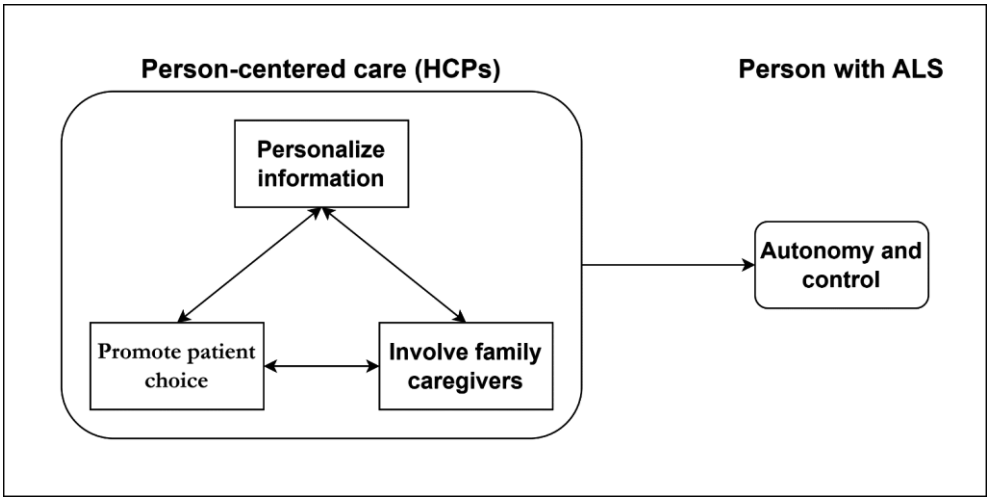

***Figure 1**. Person-centered care in ALS*

Autonomy and control

The stories and decisions of people with ALS in this thesis express a strong preoccupation with and desire for autonomy and control over decision-making about their lives and healthcare. From the moment people with ALS are diagnosed until the end of their journey, they are faced with the prospect of relentless, progressive loss of function: loss of control over their body, loss of speech and hand function impeding communication, and the risk of cognitive deterioration threaten their independence, their identity, and their autonomy as a person (2,3). A host of assistive devices and healthcare services can support people with ALS and their

> *"I have ALS, I am **not** ALS. …I just want to be able to lead my own life and keep control in my own hands. People with ALS also continue to live and you don't have to pity them."*
>
> **Person with ALS**

families in their daily needs when simple acts like walking, getting up from a chair, washing, eating, and even breathing become harder and harder, and – in the end – impossible (4). In the face of a disease that threatens to take away everything and reduce them to being a patient, people with ALS want to be in control of their healthcare, choosing when and how to engage with healthcare services, and what assistive devices to accept (5). Engaging with healthcare on their own terms helps promote a feeling of self-worth and protects their autonomy as a person (2).

Patient autonomy has been shown to be important in maintaining quality of life in ALS (1,6) and the autonomy of people with ALS has long been recognized as 'the basis of the therapeutic relationship' (7). In the absence of a cure that slows down or halts disease progression (8), ALS care focuses on symptom management and optimizing quality of life (4). One might expect quality of life to decline as function and physical health declines; however, studies show a remarkable resilience in the quality of life of people with ALS despite their functional decline (9,10). Adequate psychosocial support from family and HCPs, and holistic care are essential in helping people with ALS cope with adversity and loss, and helping their quality of life to return to homeostasis (1). Early and repeated advance care planning (ACP) can help protect an individual's autonomy and dignity in neurodegenerative diseases such as ALS (11). ACP enables individuals to identify their values, reflect upon their illness, define goals and preferences for future medical care and to discuss these goals and preferences with family and health-care providers (12). This is a holistic approach that 'addresses individuals' concerns across the physical, psychological, social, and spiritual domains' (12). Discussion of a more personalized prognosis is a good example of an early opportunity for ACP in ALS.

The diagnosis ALS is devastating for people with ALS and their families due to the prospect of unrelenting loss, limited life expectancy, and lack of clarity regarding the rate of disease progression and prognosis (13,14). **Chapter 3** shows that discussion of a more personalized prognosis with people with ALS and their families – who want to know – can help alleviate this uncertainty and help them to regain control over the future, shortly after their world has been turned upside down. People with ALS and their families said they regained some sense of control because a more personalized prognosis helped them to redefine and plan for the future, including future care, and what they hoped for: making the most of the time they had left and maintaining a satisfactory quality of life for as long as possible. Discussion of prognosis

> *"It's a bit of [short pause] an emotional rollercoaster right now. … If you know [your life expectancy], then of course you aren't completely in control, but you can start planning something. What I actually couldn't do before, when I had just been diagnosed."*
>
> **Person with ALS on discussing personalized prognosis** (65)

is important in supporting person-centered care in life-limiting neurological disorders (15,16). Without considering their prognosis, patients cannot fully oversee their choices and engage and make a well-informed clinical decision together with their families and HCPs (17). This is especially true in a progressive disease like ALS. However, the interviews in **Chapter 3** also showed that a person-centered communication, tailored to their emotional and information needs, was as important as the actual prognosis itself, in coping with the emotional impact of the prognosis and helping them redefine what they hoped for in their future. This is in line with our review of discussing prognosis in other life-limiting diseases, which concluded that prognostic discussion should be tailored to when, how, and what patients, and their families, want to know (**Chapter 2**). Patient autonomy is crucial in helping people with ALS maintain their quality of life. HCPs can support people with ALS in retaining their autonomy and support them in feeling in control by providing person-centered care through shared decision-making (SDM) and ACP that is based on personalized information, patient choice, and involvement of family caregivers.

> *"I find that I get a lot of peace from that, that I know … where I stand, where we stand as a family, and that we also have to make every day a celebration. Every day that [patient] is well, we have a party. Strange as it might be, we have no time left ... So you just live a much more active lifestyle and you grab everything you can get your hands on."*
>
> **Partner of a person with ALS on discussing personalized prognosis** (65)

Personalized information

SDM is more complex in ALS compared to other chronic or terminal diseases (18). Heterogeneous clinical presentation and speed of disease progression make a one-size-fits-all approach towards ALS care untenable (19,20). There is often a lack of clinical evidence regarding effectiveness and optimal timing of assistive devices and symptom management. Emotional factors and concerns about autonomy and quality of life often play an important role for people with ALS and their families when coming to a decision. As the journey progresses, loss of speech and hand function impair communication and there is the increased risk of cognitive deterioration; both of which may

> *"Everything went so fast that we constantly felt that, when we had finished something, the next thing had already turned up. Every week really, you are confronted by this. Walking and deterioration of respiration, resulting in ventilation, tube feeding which initially caused many difficulties."*
>
> **Partner of person with ALS**

impact the decision-making process (21). Finally, the most complicating element, and interwoven with all of the previous aspects, is the role of time and timeliness. Unlike, for example, multiple sclerosis or cancer, in ALS there are no periods of stabilization let alone remission. Because of the progressive nature of ALS, decision-making is acutely time-sensitive, i.e. there is a window of opportunity after which disease progression will make the decision irrelevant or even impossible (18). Furthermore, decision-making is continuous. Multiple decisions have to be made; some in the near future or some looming on the horizon; and events may overtake the person with ALS if they keep postponing decision-making (22).

Because of this complexity, HCPs need to personalize information during each step of SDM in ALS. In the first, important step in SDM, the HCP signals to the patient that in the (near) future a decision has to be made and that the patient's opinion is important (18,23). In ALS this must be done in a timely manner – i.e. before the decision needs to be made – to make sure disease progression does not overtake the decision-making process. Second, HCPs discuss the available options and pros and cons of each option, as well as the optimal timing of available choices; thus ensuring people with ALS have sufficient information to make a choice. Third, HCPs should support people with ALS in their deliberations by exploring their preferences and values surrounding the available choices and their preferred outcome. However, prolonged deliberation may affect the impact of assistive devices and interventions, mean they are no longer applicable or even make placement impossible. Due to the time-sensitive nature of decision-making in ALS and absence of evidence on optimal timing of interventions, HCPs may prefer a more proactive approach to symptom management in order to *stay one step ahead* of the decision-making process (18,24). Early discussion of upcoming decisions also helps people with ALS and their caregivers get used to the idea and prepare themselves emotionally. However, this can also be experienced as confronting and unnecessary, and cause friction in the HCP-patient relationship. Instead, people with ALS, supported by their caregivers, may prefer a more *wait and see* approach to assistive devices and symptom management and take it *one day at a time* (25). The complexity of decision-making in ALS clearly comes to the fore in decision-making about gastrostomy (**Chapters 5 and 6**).

Rehabilitation physicians' most frequently reported barrier to (timely) decision-making on gastrostomy was a (perceived) lack of patient readiness to make a decision – i.e. either the unwillingness to accept gastrostomy or make a decision when indicated by the physician (**Chapter 5**). Delayed placement is accompanied by an increased risk of complications or placement becoming unviable due to deteriorating health (26). Some studies also suggest early placement, i.e. before too much weight has been lost, might improve clinical outcomes such as weight stabilization and survival (27,28). Changes in metabolism likely play a role here (29). For these reasons, ALS care guidelines recommend early and

repeated discussion of gastrostomy (26,30,31), which has the added benefit of allowing people with ALS time to adjust emotionally to another loss and make a timely decision. However, clinical arguments focussing on survival or body weight may not be relevant to people with ALS for whom the impact of gastrostomy goes beyond clinical and nutritional factors (32). In fact, in our interview study in **Chapter 6,** people with ALS describe decision-making about gastrostomy as a complex, continuous process of weighing clinical factors versus personal values and feelings about autonomy and loss; these may well shift as the disease progresses. Other qualitative studies also found that the emotionally laden, and psychosocially driven nature of decision-making on gastrostomy – in which notions of choice and control, acceptance and need, fear of placement, and reluctance to give up oral feeding play an important role – can lead to people with ALS postponing the decision (33–35). This fits well with the core tenet of SDM that the patient brings their own expertise, and it is up to the HCP to elicit and explore the patient's values, preferences and needs (23). However, it also shows the tension between proactive symptom management to which a (perceived) lack of *patient readiness* can be seen as an impediment from the point of view of the HCPs versus the more value-driven decision-making of people with ALS. However, our study showed that personalizing information to individual disease course and tailoring it to their values through ACP helped people with ALS feel supported in making an informed decision (**Chapter 6)**.

> *"So I said 'I don't want to do that, I don't want to live like a plant'. …. But I did eventually come to the realisation that being tube fed doesn't mean you're a plant. … [But the rehabilitation doctor] thought I was already too weak. … I honestly believe it was simply my own fault."*
>
> **Person with ALS on gastrostomy** (84)

Personalizing information is a first and necessary step in allowing people with ALS to retain their autonomy and make a fully informed decision about their healthcare. When the pros and cons of the available options are discussed during SDM, HCPs should not focus solely on clinical benefits and indicators, but also explore values and preferences of people with ALS. This will allow HCPs to personalize and tailor information to the individual disease course, values, and preferences of each person with ALS. Telehealth and other digital innovations can help further personalize ALS care and help people with ALS feel in control of their disease and healthcare (36). People with ALS are positive about using telehealth in their care and clinical trials (37). In **Chapter 4** we describe the optional telehealth service *ALS home-monitoring and coaching* which makes it possible to remotely monitor functional status, weight and well-being of people with ALS, while providing them with personalized feedback and information. *ALS home-monitoring and coaching* was shown to improve continuity of care, personalize care, and helped people with ALS feel

> *It is an easy way for me to pass things on to the physician. I tell them what the problem is and the hospital indicates what is useful.*
>
> **Person with ALS on *ALS home-monitoring and coaching*** (98)

more in control, because it allowed them to direct the flow of information and communication with the ALS care team, enabling them to direct the care agenda. As a result, it was well received by people with ALS and HCPs and is currently being rolled out nationwide in the Netherlands (38). Similar to our communication guide for discussing personalized prognosis, this telehealth application was co-created by healthcare researchers, people with ALS, caregivers, and HCPs (39). Co-creation between stakeholders and end-users is more likely to result in an end product that is more relevant, attainable, and tailored to the needs of the end-users (40) and this partially explains the success of *ALS home-monitoring and coaching*. Thus, this thesis shows that person-centered care can be supported by personalizing information when discussing a more personalized prognosis (**Chapter 3**), using telehealth (**Chapter 4**), or during decision-making and ACP of interventions like gastrostomy (**Chapter 6**).

Patient choice

During the course of ALS, many ethically complex decisions have to be made which include initiation of assistive devices like (non-)invasive ventilation (NIV, IV) and gastrostomy. People with ALS view these as major milestones in their disease, end-of-life care preferences, and requests for assisted dying (41). Personalized information alone is not sufficient to allow people with ALS to be in control of their healthcare decision-making. A systematic review on patient-reported barriers to and facilitators to enable SDM concludes that *knowledge does not equal power*; healthcare professionals need to support patients in their deliberation and encourage them to make their own choice (42,43). In ALS, available options to discuss include 'proceeding with a symptom management option, deferring their decision to a later time or choosing to do nothing' (18).

This thesis shows that providing people with ALS with the option to postpone or refuse interventions helps them to feel in control and improves their satisfaction with healthcare and the decision-making process. In **Chapter 6,** people with ALS – and their caregivers – describe gastrostomy as inevitable, saying they felt they had no choice but to accept it because of (the prospect of) progressive loss of hand function and/or ability to chew and swallow. It has been suggested this could lead to a feeling of helplessness and an external locus of control (34). However, our study and other studies show a more ambivalent response from people with ALS and their caregivers to a gastrostomy indication, ranging from acceptance, postponement, to refusal (33–35,44). Furthermore, participants in our study said they felt in control of the decision-making process – despite this (perceived)

absence of choice – because they were supported by HCPs and caregivers to make their *own* decision in their *own* time. This requires HCPs to present the options to postpone or refuse assistive devices as valid patient choices that might be more in line with their personal values and preferences – at that point in their disease – while explaining the possible disadvantages *and* stating that the decision of the person with ALS will be respected. This will allow people with ALS to make better informed decisions, feel in control of their healthcare, and be more satisfied with HCPs and the decision-making process.

> *"No, that's right, you didn't have a choice. That's right. You reach a point where all that's left is what you can still do, rather than about what you want to do."*
> **Partner of person with ALS** (84)

HCPs might experience this as a conflict between the ethical prerogatives of beneficence and patient autonomy (1). As we already saw, HCPs might label the desire of people with ALS to postpone or refuse interventions as a lack of patient readiness to make a decision (45). However, this does not do justice to autonomy of people with ALS. Besides the ethical imperative of patient autonomy, the heterogeneous nature of ALS, absence of a cure, and lack of evidence on effectiveness and timing suggest ALS care should be classified as *preference-sensitive care* in which the treatment choice should 'depend on informed patient choice' (46). In this case it is imperative that 'the wishes of patients in regard to gastrostomy, long-term ventilation and end-of life decisions [are] considered in an unbiased fashion' (47).

Deciding on end-of-life

Shortly after being diagnosed, many people with ALS in the Netherlands inquire about the options involving euthanasia when life becomes unbearable (14). In our study on discussing personalized prognosis, some of the interviewees, without being prompted, stated their desire for euthanasia when the end was near and they expected that their quality of life would no longer be acceptable to them (**Chapter 3**). In **Chapter 7** we showed that between 2012 and 2020, around one in four people with ALS in the Netherlands chose euthanasia; however, we also show that the frequency of euthanasia did not appear to negatively impact survival and co-occurred with a high satisfaction with end-of-life care. Furthermore, we found that people with ALS more often chose to hasten death compared to other patient groups;

> *"It's not just life expectancy, it's also when you look at ALS: how it progresses. Then the quality of life that deteriorates rapidly … And I'm really going to look into euthanasia. Because I really don't want to keep going until the very last moment."*
> **Person with ALS on end-of-life** (65)

this corroborates findings from studies in Belgium, Canada, and Oregon and Washington (USA) (48–51). Caregivers in our study more often reported dignity and dependency as reasons to hasten death which was also similar to previous studies in the Netherlands, and Oregon and Washington (USA) (50,52). The desire for assisted dying appears to result from a desire to control the circumstances of their death in the face of the progressive nature of ALS (53).

Discussion of end-of-life care preferences and assisted dying in ALS are some of the most sensitive and ethically complex discussions for all involved; here, personal values play a central role (41,47,54). Despite palliative care aimed at comfort and maximizing quality of life, patients with ALS may develop a wish to hasten death (54). Studies suggest that up to half of people with ALS may express a wish to hasten death, most commonly to their family, or can imagine asking for assisted dying (55,56). Many welcome the opportunity to discuss end-of-life care preferences with their physician; however, this does not happen often (55,57,58) resulting in end-of-life care that is not according to their wishes (58). This desire to engage in ACP goes beyond the Netherlands, as studies from – amongst others – Germany, Switzerland, United Kingdom to USA show (55–58). A short casus (**Chapter 8**) illustrates how patient autonomy concerning end-of-life care preferences can be supported through early and repeated ACP. Discussing these end-of-life preferences through ACP and recording them as advance directives helps preserve the autonomy of people with ALS (59).

These end-of-life discussions should take place early and regularly during ACP when the person with ALS and their family are ready for them. A recent review recommended timely and regular discussion of end-of-life care preferences and concluded that 'avoiding or delaying communication and decision-making, and ignoring or disregarding the preferences of people with ALS are not in line with ethical principles of autonomy and non-maleficence' (60). Timeliness of ACP is especially important in ALS due to the increased risk of communication and cognitive impairments in later disease stages (4). Systematic reviews show that ACP increases the completion of advance directives and improves congruence between patient's wishes and received care (61,62). ACP in ALS may also provide people with ALS with a sense of control and peace of mind, support discussion of end-of-life care preferences in the family and with HCPs, and facilitate acceptance of the disease and inevitable death (63). When discussing end-of-life

> *"Suppose it were a year and a half. Then I think I would divide it into a year and six months and I think that the last six months is no longer acceptable to me ... So my life expectancy is then one and a half years minus half a year, let's say. I'm just going to take charge of that myself ... That does give me peace of mind."*
>
> **Person with ALS on end-of-life** (65)

care preferences, patient autonomy and self-determination should be emphasized (64). Emphasizing patient autonomy and self-determination in end-of-life decision-making, discussing and recording end-of-life care using advance directives may help patients with ALS regain control and retain dignity in dying. People with ALS are faced with the prospect of total loss of function and the inability to communicate their wishes easily. Discussion of end-of-life care preferences, including the wish to hasten death, helps reassure people with ALS they are in control of the circumstances surrounding their death – i.e. when, how, and where they die (65,66).

Caregivers and family

ALS has been described as a family illness with loved ones playing an important role by providing emotional support and taking on many aspects of care (67). This can place a significant burden on caregivers, spouses especially, and cause them a great deal of stress, especially as the disease progresses or when the person with ALS experiences cognitive impairments (68). This can result in caregivers themselves needing support, in the form of more personal time, assistance in applying for resources, counselling, and peer contact; however, they may be reluctant to apply and accept support, as some caregivers consider their needs secondary to those of the patient (69). Information needs can differ between people with ALS, but also between people with ALS and their caregivers. For example, caregivers desire more information on services and resources, and skills, not surprising perhaps when we consider their crucial role in daily care (70). Caregivers may also have a stronger desire for information about the course of the disease and prognosis (71,72). Our study suggests they may have a stronger need for prognostic certainty because it allows them to better plan future care and for the time after the death of their spouse or parent, and because they do not personally experience the rate of deterioration (**Chapter 3**).

Studies in terminal cancer and other life-limiting diseases report patients saying that the prognosis can, with patient permission, be discussed with family if the patient does not want to know (73,74). In the case of diverging information needs, we, therefore, recommend asking the person with ALS for permission to discuss a more personalized prognosis with their spouse or family, if they want to know (75). Information provision should be

> *"I have now received confirmation of what [my partner] thought. … I have to arrange all kinds of things for the future. I actually need to stay just one step ahead of her disease, which is worsening, for example with aids. That's why I wanted to know. It makes a big difference whether you have to take care of someone who has four years left or someone who has one year left."*
>
> **Partner of person with ALS about discussing personalized prognosis** (65)

tailored to people with ALS but also their family to allow more informed decision-making and planning of future care.

Caregivers can also experience conflicting roles in relation to decision-making: supporting patient autonomy while promoting patient acceptance; a one-day-at-a-time approach while also planning ahead (25). Both declining and accepting gastrostomy placement come with its own advantages for and burdens on caregivers (76). People with ALS dislike feeling a burden on their family (77). Considerations on perceived caregiver burden can influence decision-making of people with ALS and lead them to accept or decline interventions they consider as life-prolonging – e.g. NIV or gastrostomy – in order not to prolong the burden on their family *or* because their family wants them to carry on living (34,44,77–79). It is important that these complex topics are acknowledged by HCPs and the values and preferences of both people with ALS and their caregivers are discussed in the context of decision-making – for example – on gastrostomy. However, our study also showed that caregivers can play a crucial role in supporting patient autonomy and, as a result, people with ALS said they felt no pressure from their spouse in their decision-making on gastrostomy nor did caregiver burden play a role (**Chapter 6**). On the contrary, caregivers emphasized it was the decision of the person with ALS and they collaborated and supported their partner or parent during decision-making. Intercultural communication barriers, such as linguistic barriers or differences in values regarding health and illness and in role expectation, may complicate SDM and the role of family (80). Topics like prognostic discussion, treatment options, and end-of-life care require even more ethical sensitivity when there are cultural differences between the HCP and the patient and their family. Family often play a much more prominent role in healthcare interactions; this can require some adjustment from HCPs (81). However, many of the core communication skills remain the same (82) and HCPs can consult guidelines on intercultural communication for support (83). Overall, family caregivers have a crucial role; it is important that HCPs involve them in the decision-making process because – as our thesis shows – this supports SDM and patient autonomy (18,84).

> *"[He] likes to be in control. Of course we've discussed this together, but it's [his] body and it's also [his] decision."*
> **Partner of person with ALS on decision-making about gastrostomy** (84)

Person-centered care

'Person-centered care highlights the importance of knowing the person behind the patient – as a human being with reason, will, feelings, and needs – in order to engage the person as an active partner in his/her care and treatment' (85). As we have shown, a more person-centered approach, based on tailored and personalized information, while

promoting patient choice and involving family caregivers, helps people with ALS participate in SDM and supports their autonomy (**Chapters 3 & 6**). This approach can be supported by prediction models, decision tools, telehealth applications, and includes discussion of complex, emotion-laden, and ethically sensitive topics like personalized prognosis, gastrostomy, and assisted dying through ACP. However, this requires a willingness as well as time and effort to explore the person, not just the patient, investment in communication (skills), and dedication to soft skills like empathy. It also means accepting and supporting patient choice, even though HCPs might prefer a more proactive approach to care and symptom management (25). There are a number of ways this thesis supports HCPs in providing person-centered care.

> *"I think that's actually one of the great things about our profession, that you can get so close to someone – make it so personal, think along with someone like this, empathise – and watch that person go through the process of arriving at a decision like that. It's valuable and appropriate to him or her, whatever decision that is."*
>
> **Physician on supporting people with ALS on their journey** (84)

Receiving the diagnosis ALS is not just devastating for people with ALS and their loved ones, but delivering the bad news may also be difficult and stressful for neurologists (86). Adding discussion of a more personalized prognosis increases this complexity and may result in further bad news in the case of a shorter than average prognosis. However, as we have shown, concerns about a negative emotional impact of discussing a personalized prognosis appear unfounded (**Chapter 3**). Nevertheless, physicians may still be hesitant in using prediction models. Barriers include filling in the prediction model, dealing with missing or incorrect variables, communicating uncertainty surrounding the outcomes, and discussing numerical estimates in a manner that is easily understood by patients and their families (87–89). Our communication guide (**Chapter 2**) provides recommendations to help physicians feel confident in overcoming these barriers and supports them in tailoring discussion of personalized prognosis to individual needs and preferences of people with ALS.

Physicians in our focus group also agreed that filling in the *ENCALS survival model* and discussing personalized prognosis takes time, but, after a small learning curve, was no more difficult or stressful than other bad news conversations in ALS (**Chapter 3**). There are many excellent communication guides and tools to further support HCPs in having bad news conversations and with prognostic disclosure (90–92). Sufficient time should be set aside to discuss these topics in a manner that is satisfactory for people with ALS and their family and supports them in coping with the news and their emotions (93). In the

> *"If you take the time, you are talking about things that actually affect the patient deeply ... And, that, I think is a very nice step towards very personal guidance ... It can deepen your contact, which is a nice basis for further conversations."*
>
> **Physician on discussing a more personalized prognosis** (65)

Netherlands this is, partially, facilitated by offering a two-tiered appointment for delivering the diagnosis and providing sufficient information (14). ACP aimed at exploring the values, goals and preferences of people with ALS as part of a holistic approach can also be an invaluable component (11,12). When carried out in this manner, discussing personalized prognosis – for example – can be a good start for discussing the disease trajectory, and exploring values and personal care preferences of people with ALS and, thus, facilitating more person-centered care.

Studies show that besides the potential power-imbalance between HCPs and patients (42,43), there are further potential barriers to SDM during the course of ALS. As the disease progresses, communication impairments – due to deterioration of the ability to speak and hand function - and cognitive impairments may affect the ability of people with ALS to participate in SDM, although to what extent is not yet fully understood (21). For example, the speech of most of the people with ALS participating in our study on decision-making about gastrostomy was impaired, ranging from difficult to understand to only being able to make sounds in affirmation or denial (**Chapter 6**). Nevertheless, and despite stating they had no choice, people with ALS felt in control, because they were supported by HPCs and their caregivers to make their own decision.

Clinical and research recommendations

This thesis provides information to help HCPs personalize and tailor ALS care, focusing on the goal of supporting patient autonomy and informed decision-making by people with ALS. In our rehabilitation research group, a new project has started aimed at maximizing quality of life of people with ALS, progressive muscular atrophy, and primary lateral sclerosis by personalizing and increasing their control over their care. **Chapter 4** showed that the telehealth innovation, *ALS home-monitoring and coaching,* helps personalize ALS care. This new project will blend (traditional) multidisciplinary care with *ALS home-monitoring and coaching,* aiming to make the latter more broadly available to (all) people in ALS care in the Netherlands. Other home-monitoring projects, allowing for more personalized care in the future, include remote monitoring of unsupervised testing of vital capacity (94) and muscle strength testing using portable fixed dynamometry (95). Another project that is underway aims at improving holistic ALS focused on the whole person and aimed at developing tools – a conversational aid (i.e. 'gesprekskaart') – to support communication and deliberation between people with ALS and their families and loved

ones, and their HCPs. This conversational aid is (partly) based on Hogden's model for SDM (18).

In this thesis, we have not discussed decision support tools which are also well suited to personalize care and support timely and informed decision-making (22). They have been shown to decrease indecision about personal values, increase patient engagement in decision-making, strengthen patient-clinician communication, increase patient satisfaction with the decision and decision-making process, and reduce unnecessary treatment (96). One ALS-specific example of such a decision support tool is mnddecisiontools.com, an online, interactive decision tool co-designed together with – amongst others – people with ALS, caregivers, HCPs, researchers (25,97). It helps people with ALS explore what is important to them and provides clinical information on a number of difficult decisions (i.e. gastrostomy, assisted ventilation, genetic testing, choice of end-of-life care location, communication equipment, and advance care planning). Thus, decision support tools can facilitate more personalized, person-centered care. However, providing decision support tools alone is not sufficient to guarantee that patients will be able to engage successfully in SDM unless they are supported in being in control over the decision-making process and their healthcare (42). As we have seen, the attitude of HCPs, and family and caregivers, are pivotal in supporting the autonomy of people with ALS.

Recommendations for clinical practice

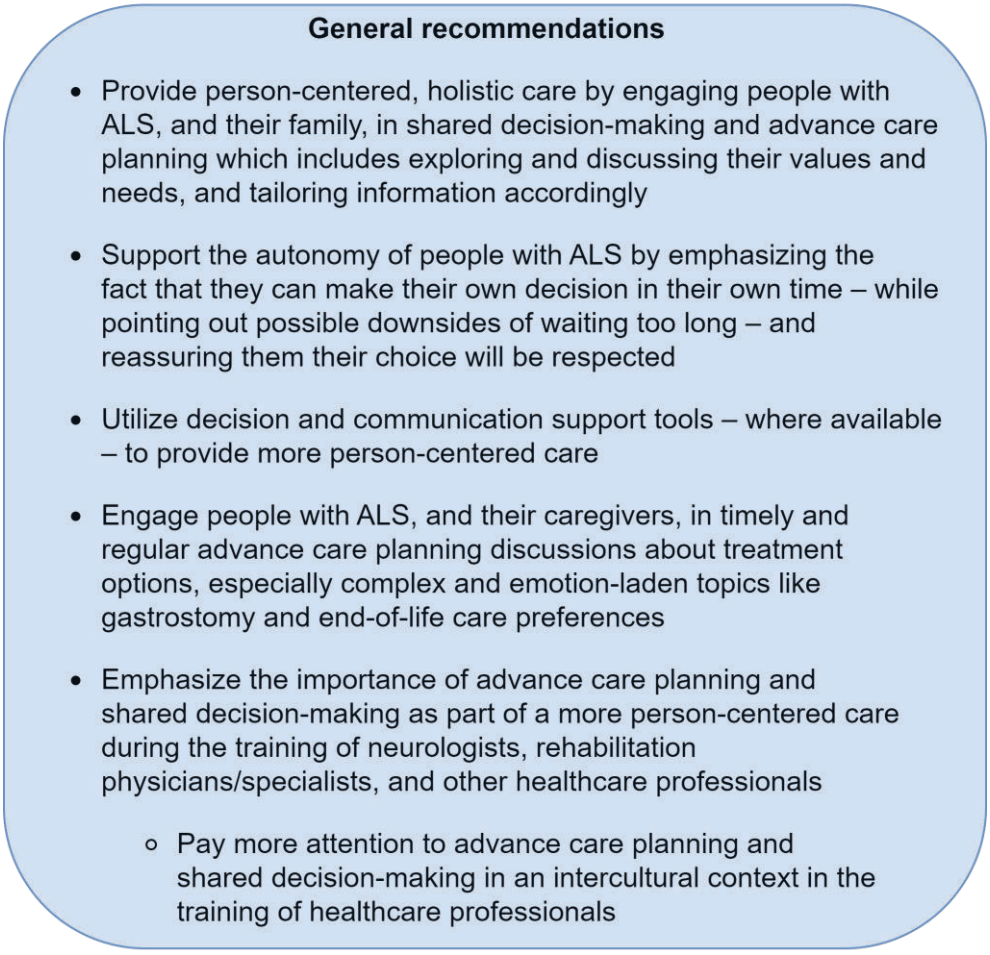

Figure 2 *General recommendations for clinical practice*

Specific recommendations for clinical practice

Specific recommendations

Personalized prognosis

- Offer people with ALS, and their family, the opportunity to discuss a more personalized prognosis, based on the *Personalized ENCALS survival prediction model,* shortly after their diagnosis (e.g. as part of a second appointment), and tailored individual values and needs using our communication guide
- Use prognostic disclosure as a starting point to discuss the future, including future healthcare, and the role of the ALS care team and support they can provide

Telehealth

- Offer telehealth solutions, where available, to enable a more accessible care tailored to individual needs and preferences, offering room for patient-initiated care, and constant monitoring of essential values

Gastrostomy

- Do not focus solely on discussing clinical benefits and indicators of gastrostomy, but explore values and preferences of people with ALS about gastrostomy to better support them in decision-making
- Discuss multiple options – i.e. acceptance, refusal, postponement of decision-making – as equally valid and support patient choice

End-of-life

- Engage people with ALS in timely discussion and advance care planning of their end-of-life care preferences including wishes surrounding assisted dying

Figure 3 *Specific recommendations for clinical practice*

Recommendations for future research

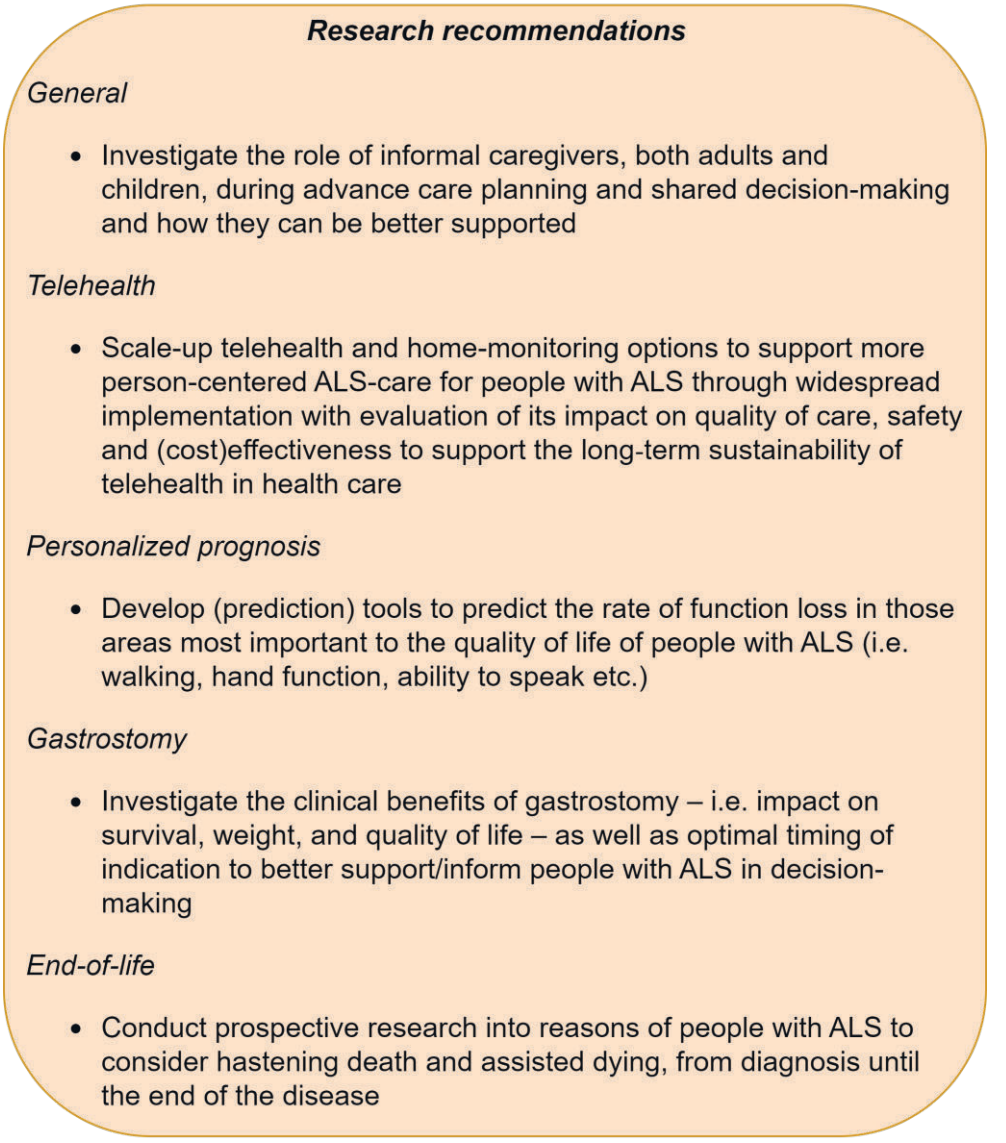

Figure 4 *Recommendations for future research*

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CHAPTER

10

Samenvatting in het Nederlands

Inleiding

Amyotrofische laterale sclerose

Amyotrofische laterale sclerose (ALS) is een zeer ernstige en ongeneeslijke ziekte. De motorische zenuwcellen in de hersenen, de hersenstam en het ruggenmerg – die de spieren in het lichaam aansturen – sterven langzaam af. Dit leidt tot zwakte en uiteindelijk verlamming van spieren. Hierdoor verliezen mensen met ALS in toenemende mate alle controle over hun lichaam en worden ze geconfronteerd met functieverlies. Het bewegen van handen en voeten wordt steeds moeilijker, lopen of objecten vastpakken wordt onmogelijk; slikken, spraak, ademhaling kunnen allemaal aangetast worden en de meeste mensen met ALS overlijden uiteindelijk door ademhalingsproblemen.

Nederland telt ongeveer 1500 mensen met ALS. Elk jaar overlijden er rond de 500 van deze 1500 en elk jaar krijgen rond de 500 mensen de diagnose ALS. Op dit moment is er helaas nog geen geneesmiddel, wel bestaat het middel riluzole dat de levensduur met enkele maanden verlengt. De zorg voor mensen met ALS richt zich op het ondersteunen van hun kwaliteit van leven en symptoombestrijding.

De levensverwachting na het ontstaan van de eerste symptomen is gemiddeld 3 tot 4 jaar maar varieert sterk in ALS van enkele maanden tot meer dan 10 jaar. Ook het ziektebeloop verschilt per patiënt, soms begint het met spraakproblemen spraak (bv. dronkenmansspraak), de handen (bv. verminderde kracht in één van de handen) of de voeten (bv. een slepende voet met veel struikelen tot gevolg). Naast dit functieverlies is er bij de helft van de mensen met ALS tijdens het ziektebeloop ook sprake van cognitieve en gedragsveranderingen, en één op de acht heeft zelfs dementie met ernstige gedragsveranderingen.

De impact van ALS

De diagnose ALS heeft een grote impact op de persoon met ALS maar ook diens familie. Deze aandoening ontneemt ze de toekomst die ze voor ogen hadden en maakt plaats voor het vooruitzicht van toenemende beperkingen en het feit dat ze nog maar enkele jaren te leven hebben. Alles wat we voor lief nemen – opstaan uit je stoel, een wandeling maken, praten, eten en drinken, ademen, het knuffelen van geliefden – verwordt mettertijd tot een Herculische taak naar mate het lichaam meer en meer verstilt.

Desalniettemin laten veel mensen met ALS een opmerkelijke veerkracht zien wanneer zij geconfronteerd worden met dit lot. Familie speelt hierin een belangrijke rol, niet voor niets wordt ALS dan ook wel als een familie aandoening aangeduid. Zij ondersteunen hun geliefde met ALS op emotioneel vlak en nemen vaak veel van de dagelijkse zorg voor hun rekening.

Gedeelde besluitvorming

De nooit aflatende progressie van ALS en variabiliteit van het ziektebeloop, die voor elke patiënt anders en met een verschillende snelheid verloopt, (d.w.z. er is geen vast ziektebeloop) maakt dat er veel complexe en vooral ook tijdsgevoelige beslissingen moeten worden genomen. Tijdige, proactieve besluitvorming stelt zorgverleners in staat om mensen met ALS in dit besluitvormingsproces te ondersteunen en ze te helpen om de ziekte een stapje voor te blijven. Hiervoor is holistische, op maat gemaakte zorg toegesneden op het individuele ziektebeloop cruciaal die aansluit bij de waarden en voorkeuren van de persoon met ALS. Dit wordt ook wel *persoonsgerichte zorg* genoemd waarbij de persoon van de patiënt, niet diens medische, centraal staat en de voorkeuren, behoeften en waarden van de patiënt worden gerespecteerd meegenomen bij de klinische besluitvorming.

Voorwaarde voor persoonsgerichte zorg is *gedeelde besluitvorming*. Tijdens het proces van gedeelde besluitvorming brengt de zorgverlener de patiënt op de hoogte dat (binnenkort) een beslissing moet worden genomen. De zorgverlener bespreekt de plus en minpunten van de beschikbare opties. De zorgverlener onderzoekt de wensen, voorkeuren en waarden van de patiënt. De zorgverlener en patiënt nemen samen een beslissing. Met name in de ALS zorg is het belangrijk dat hierbij ook de naasten bij worden betrokken. Onderzoek naar gedeelde besluitvorming laat zien dat het een positieve impact heeft op gezondheidsuitkomsten en tevredenheid van de patiënt met de uiteindelijke keuze.

Er bestaat echter nog weinig informatie over de complexiteit van het besluitvormingsproces in ALS vanuit het perspectief van mensen met ALS, en hun naasten en zorgverleners. Het doel van dit proefschrift is *meer inzicht verkrijgen in de ervaringen van mensen met ALS, hun naasten en hun zorgverleners met gezamenlijke besluitvorming en hoe dit beter ondersteund kan worden*. Meer inzicht hierin zal zorgverleners helpen om de zorg beter en meer op maat te kunnen bieden en mensen met ALS en hun naasten beter te ondersteunen om goed geïnformeerde beslissingen te nemen tijdens ziektebeloop.

Deel 1. Het begin

Sinds 2018 is het mogelijk om met behulp van een nieuw predictiemodel en op basis van acht ziektekenmerken een meer persoonlijke inschatting te maken van de levensverwachting van mensen met ALS. Voor artsen kan het bespreken van een prognose, vooral als deze slecht uitpakt, lastig en stressvol zijn. Zij zijn bezorgd om mensen met ALS en hun familie hoop te ontnemen en stress te bezorgen. Ook is het onduidelijk wat patiëntbehoeften zouden zijn rondom het bespreken van hun persoonlijke prognose. Daarom hebben we – in samenwerking met mensen met ALS, naasten, artsen

en andere deskundigen – stapsgewijs een handreiking opgesteld om artsen te ondersteunen in het bespreken van de persoonlijke prognose, o.b.v. het predictiemodel, met mensen met ALS en hun naasten (**hoofdstuk 2**).

Voor het opstellen van deze handreiking hebben we eerst literatuuronderzoek gedaan naar de impact van het bespreken van een (persoonlijke) prognose in andere, dodelijke aandoeningen – met name terminaal kanker. Op basis hiervan concludeerden we dat het bespreken van de prognose geen negatief effect hoeft te hebben op het mentaal welbevinden (d.w.z. angst en depressie) of hoop van de patiënt. Het kan, aldus patiënten in deze onderzoeken, juist helpen in om betere besluiten te nemen, voor het plannen van de toekomst, en kan een gevoel van controle geven. Hierbij is het wel essentieel om aan te sluiten bij de patiënt en *of*, *wanneer*, *hoeveel*, en *wat* deze wil weten over diens levensverwachting.

Om artsen verder te helpen, hebben wij een serie adviezen opgesteld voor het invullen van het predictiemodel en het bespreken van de persoonlijke prognose. Dit is gedaan door een multidisciplinaire werkgroep van neurologen, revalidatieartsen en onderzoekers, met feedback van een expert panel met daarin mensen met ALS, een naaste (dochter), onafhankelijke revalidatiearts, ethicus, en geestelijk verzorger. Onze belangrijkste adviezen richtten zich op a) het onderzoeken en aansluiten bij de individuele behoeften van de persoon met ALS, b) betrekken van naasten en familie, c) verschil in informatiebehoefte tussen de persoon met ALS en de familie, d) niet-westerse patiënten, e) patiënten met serieuze cognitieve beperkingen dan wel frontotemporale dementie. De Nederlandse handreiking en belangrijkste adviezen is als bijlage bij hoofdstuk 2 opgenomen.

In **hoofdstuk 3** onderzochten we vervolgens de ervaringen van mensen met ALS, hun naasten, en artsen met het bespreken van de persoonlijke prognose. Hiervoor hebben we 13 mensen met ALS en 10 naasten geïnterviewd; daarnaast hebben we een focusgroep gehouden met vijf artsen. Mensen met ALS vertelden dat de negatieve emotionele impact van het bespreken persoonlijke prognose minimaal was. *Hoe* dit werd besproken –of er voldoende werd aangesloten bij de individuele behoeften – was hierbij volgens de deelnemers aan de interviews net zo belangrijk als *wat* er werd besproken – goed of slecht nieuws over de

Ik wil altijd graag de controle houden. Ja, en als je dan [je individuele levensverwachting] weet, dan heb je natuurlijk niet helemaal de controle maar je kunt wel iets gaan plannen. Wat je daarvoor, toen ik net de diagnose had, eigenlijk nog niet kon. Dus ik vind het wel belangrijk om dat te weten, om ja misschien weer een klein beetje grip op het leven te krijgen.

Persoon met ALS over de individuele levensverwachting

levensverwachting. Persoonlijke factoren zoals copingstijl, eerdere ervaringen met ziekte/ALS, en verschillen in informatiebehoeften bleken hierin ook een belangrijke rol te spelen. Daarbovenop vertelden mensen met ALS en hun naasten een meer persoonlijke prognose behulpzaam was om weer wat grip te krijgen op de toekomst en bij het plannen van de toekomst en benodigde zorg. Tot slot vertelden veel deelnemers dat zij de kwaliteit van leven belangrijker vonden voor de hun nog resterende levensduur dan de lengte van die levensduur.

Deel 2. Leven met ALS

ALS zorg in Nederland

In Nederland wordt ALS gediagnosticeerd door een neuroloog en deze diagnose wordt veelal bevestigd in het ALS Centrum Nederland – het expertisecentrum voor patiënten met ALS, progressieve spinale musculaire atrofie (PSMA) en primaire laterale sclerose (PLS) – verbonden aan het Universitair Medisch Centrum (UMC) Utrecht. Het doel van het ALS Centrum is om de diagnostiek, zorg en behandeling te optimaliseren door nationale en internationale samenwerking.

Na hun diagnose worden mensen met ALS voor hun zorg doorverwezen naar één van de rond 35 regionale *ALS-behandelteams*. Deze multidisciplinaire teams worden gecoördineerd door een revalidatiearts en bevatten een fysiotherapeut, ergotherapeut, logopedist, diëtist, maatschappelijk werker en psycholoog; ook kunnen er nog andere zorgverleners aan zijn verbonden zoals een verpleegkundige of geestelijk verzorger. Daarnaast werkt het ALS-behandelteam samen met de huisarts en het thuiszorgteam die vaak ook betrokken zijn bij de zorg voor mensen met ALS.

In het verloop van de ziekte moeten mensen met ALS, samen met hun naasten en zorgverleners, veel beslissingen nemen over hun zorg. Zorg op afstand – oftewel digitale zorg – maakt het mogelijk om de juiste informatie en zorg op het juiste moment aan te bieden met minder belasting voor patiënten en meer eigen regie over het zorgproces. In **hoofdstuk 4** evalueerden we het gebruik, tevredenheid, en gebruikservaringen van mensen met ALS en zorgverleners met het digitale zorgconcept *ALS Thuismeten en Coachen* dat gebaseerd is op thuismonitoring. In *ALS Thuismeten en Coachen* onderhouden mensen met ALS via de ALS-app laagdrempelig contact met hun zorgverleners en geven zij zelf gegevens over hun gezondheid door aan hun zorgverlener. Een zorgcoach geeft feedback op de ingevulde gegevens, beantwoordt vragen en regelt afspraken met het ALS-behandelteam als dat nodig is.

Uit ons onderzoek bleek dat 80% van 50 patiënten verbonden aan het ALS-behandelteam in het UMC Utrecht van start zijn gegaan met *ALS Thuismeten* en slechts twee mensen voortijdig zijn gestopt omdat het niet aansloot bij hun behoeften. Gemiddeld gebruikten mensen het 11 maanden lang. De meerderheid van de gebruikers vond het platform gemakkelijk in het gebruik, behulpzaam in de zorg, waren blij met de gepersonaliseerde feedback, ervaarden meer controle over hun zorg, en vonden de zorg met de ALS-app beter dan traditionele zorg. Uit interviews kwamen ook negatieve ervaringen naar voren: problemen met inloggen en confrontatie met wat komen gaat. Maar ook veel positieve ervaringen, ze benoemden de gebruiksvriendelijkheid, vonden het weinig belastend, zette aan tot zelfreflectie, gaf een gevoel van controle, bood continuïteit van zorg en meer flexibele consulten. Ook zorgverleners waren positief en gaven aan dat ALS Thuismeten en Coachen van toegevoegde waarde was in de ALS zorg. Concluderend kunnen we zeggen dat digitale zorg via *ALS Thuismeten en Coachen* positief wordt ervaren door mensen met ALS en hun zorgverleners. Daarnaast helpt het om de ALS zorg meer op maat aan te bieden doordat consulten meer flexibel ingepland kunnen worden.

Gastrostomie

Door problemen met kauwen, slikken, en verminderde handfunctie (waardoor eten niet meer gesneden of naar de mond gebracht kan worden) wordt het in de loop van ALS vaak moeilijk voor mensen om voldoende voeding en vocht tot zich te nemen. Om gewichtsverlies en een slechte voedingstoestand tegen te gaan, maar ook vanwege een verhoogd risico op verslikken en stikken, kan kunstmatige voeding via gastrostomie (een maagsonde gastrostomie) worden overwogen. Echter, variatie in ziektebeloop en gebrek aan wetenschappelijk bewijs over de effectiviteit van gastrostomie op overleving, gewicht en kwaliteit van leven, bemoeilijken een uniform beleid rondom plaatsing van een maagsonde. Daarom wilden we meer inzicht verkrijgen in het huidige beleid, barrières en ondersteuningsbehoeften van revalidatieartsen rondom de indicatiestelling (d.w.z. advies dat een maagsonde mogelijk nodig is en een oplossing biedt) en plaatsing van maagsondes bij ALS in Nederland. Hiertoe hebben we revalidatieartsen verbonden aan ALS-behandelteams uitgenodigd om een vragenlijst hierover in te vullen (**hoofdstuk 5**). Hieruit bleek dat er veel variatie bestaat tussen de teams in 1) wanneer gastrostomie voor het eerst wordt besproken en 2) in de voorkeur voor methode van plaatsing. Daartegenover was er overeenstemming over de belangrijkste doelen (optimaliseren voedingstoestand, veilige voedselinname, vergemakkelijken van moeizame maaltijden) en de klinische redenen (bv. gewichtsverlies, dysfagie, terugkerende luchtweginfecties) op basis waarvan een maagsonde werd geadviseerd. De meerderheid van de revalidatieartsen gaf aan *barrières* te ervaren rondom de indicatiestelling, met als belangrijkste a) het uitstellen van het nemen van een beslissing door patiënten en b) het vaststellen van de juiste timing van de indicatiestelling en/of plaatsing. Dit was terug te zien in hun *behoeften* aan a) meer op

het individu toegespitste patiëntvoorlichting en b) meer wetenschappelijk bewijs om de timing van de indicatiestelling op te baseren. We raden daarom aan dat ALS-behandelteams het onderwerp vroeg en regelmatig bespreken met mensen met ALS.

De besluitvorming over de maagsonde is niet alleen voor revalidatieartsen moeilijk en complex. Voor mensen met ALS kan het ook een lastige en emotioneel beladen beslissing zijn die symbool staat voor opnieuw een stap achteruit in hun ziekte, een nieuw verlies. Daarom is er meer inzicht nodig in de complexiteit van het besluitvormingsproces rondom de maagsonde om zorgverleners te helpen om de informatie en besluitvorming beter toe te snijden op de individuele patiënt. Hiertoe hebben we alle betrokkenen – mensen met ALS, naasten en zorgverleners) in een interview bevraagd naar hun ervaringen met de besluitvorming (**hoofdstuk 6**). Mensen met ALS omschreven het besluitvormingsproces als een continue proces waarin ze de (toekomstige) klinische noodzaak en behoeften afwogen tegen hun waarden en behoeften. Tijdens dit proces kwamen ze dan uiteindelijk tot een beslissing om een maagsonde te accepteren of af te wijzen, of het besluit uit te stellen. Deelnemers vertelden dat ze tijdens dit proces werden ondersteund door naasten en zorgverleners. Verder omschreven mensen met ALS de maagsonde als onvermijdelijk. Desondanks wisten ze echter een gevoel van controle en zelfbeschikking te behouden over het besluitvormingsproces door *zelf* te bepalen *wanneer* zij de beslissing namen om de maagsonde te accepteren. Ze omschreven de volgende belangrijke factoren in het besluitvormingsproces: fysieke noodzaak, ervaringen rondom verlies en identiteit, en verwachtingen rondom de plaatsing (bv. pijn en hulpeloosheid). Besluitvorming werd omschreven als een familieproces waarbij naasten de keuze van de persoon met ALS ondersteunden. Net als de zorgverleners die hun autonomie en waarden respecteerden.

Op basis van ons onderzoek kunnen we concluderen dat hoewel mensen met ALS een maagsonde als onvermijdelijk beschouwen, zij toch een gevoel van controle en zelfbeschikking ervaren over het besluitvormingsproces zolang zij hun *eigen keuze* in hun *eigen tempo* kunnen maken en hierin worden *ondersteund door naasten en zorgverleners die hun waarden en keuzes respecteren*.

Deel 3. Beslissingen rondom het levenseinde

De diagnose ALS confronteert mensen met de eindigheid van hun bestaan. Dit is, logischerwijs, een enorme schok die hun hele wereld op zijn kop zet en veel mensen met ALS aanzet om na te denken over hun naderende levenseinde. In Nederland bestaat een lange traditie van (vroeg)tijdig plannen van zorg binnen het palliatieve traject (d.w.z. bij mensen die geen vooruitzicht op genezing hebben). Ook is sinds 2002 de mogelijkheid tot euthanasie in het aanzicht van ondraaglijk en ongeneeslijk lijden wettelijk geregeld. Kort na hun diagnose onderzoeken veel mensen met ALS in Nederland dan ook de mogelijkheden rondom euthanasie.

In **hoofdstuk 7** onderzochten we hoe vaak mensen met ALS kiezen voor euthanasie, of dit is toegenomen vergeleken met eerdere onderzoeken tussen 1994 en 2005 en welke factoren samenhangen met een keuze voor euthanasie. Daarnaast onderzochten we ook de kwaliteit van zorg tegen het einde van het leven en de impact op overleving geassocieerd met een keuze voor euthanasie (oftewel hebben mensen met ALS die kiezen voor euthanasie een (veel) kortere overleving dan diegene die niet voor euthanasie kiezen). Hiertoe hebben we de euthanasiecommissie, bij wie alle gevallen van euthanasie moeten worden aangemeld, gevraagd te onderzoeken hoe vaak de onderliggende aandoening ALS was. Daarnaast hebben we alle bij ons bekende naasten en artsen van mensen met ALS overleden in de periode 2014-2016 gevraagd een vragenlijst in te vullen.

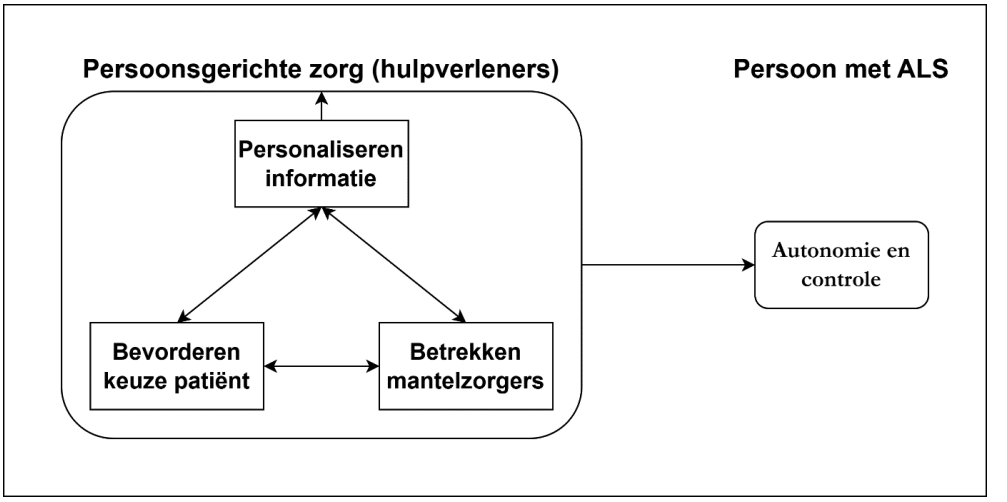
Op basis van cijfers van de euthanasiecommissie schatten we dat tussen 2012 en 2020 ongeveer 25% van mensen met ALS heeft gekozen voor euthanasie. Dit is een toename vergeleken met 15-17% euthanasie in de periode 1994-2005. Ondanks dat euthanasie het levenseinde bekort, was de *overlevingsduur van mensen die voor euthanasie kozen niet korter* vergeleken met de mensen die niet voor euthanasie kozen. De keuze voor euthanasie hing niet samen met patiënt- of ziektekenmerken, depressie of hopeloosheid, of de ervaren kwaliteit van zorg. Volgens naasten waren een *verlies aan waardigheid* en *afhankelijkheid* de *meest genoemde redenen om voor euthanasie te kiezen* en het levenseinde te bespoedigen vergeleken met diegenen die niet voor euthanasie kozen.

Op basis van ons onderzoek kunnen we concluderen dat het percentage mensen met ALS dat voor euthanasie kiest is toegenomen sinds de invoering van de wetgeving in 2002. De keuze voor euthanasie is een individueel, existentieel besluit dat samenhangt met een verlies aan autonomie en waardigheid, aldus naasten. Ook laat ons onderzoek zien dat een hoge frequentie van euthanasie kan samengaan met een goede ervaren kwaliteit van zorg zonder het levenseinde te bekorten, wat erop wijst dat euthanasie overwegend tegen het einde van de ziekte plaatsvindt. Toekomstige studies zouden meer aandacht moeten besteden aan de impact en het belang van het (vroeg)tijdig bespreken van zorgbehoeften rondom het levenseinde en de impact daarvan op de kwaliteit van leven en kwaliteit van overlijden.

Tot slot (**hoofdstuk 8**) beschreven we in een korte casus over een persoon met ALS hoe het (vroeg)tijdig bespreken van zorgbehoeften rondom het levenseinde leidde tot een weloverwogen keuze voor euthanasie.

Conclusie

Vanaf het begin van hun ziektebeloop tot het einde worden mensen met ALS geconfronteerd met een veelvoud aan moeilijke, ethisch complexe en veelal tijdsgebonden beslissingen over hun toekomst en zorg. In dit proefschrift hebben we het besluitvormingsproces over de zorg bij ALS onderzocht vanuit het perspectief van mensen met ALS, naasten en zorgverleners. Zorgverleners hebben de moeilijke maar dankbare taak om hierbij een evenwicht te vinden tussen de ethische principes van weldoen en autonomie van de patiënt. In **hoofdstuk 9**, de algemene discussie, bediscussiëren we de belangrijkste bevindingen uit dit proefschrift. Hierbij focussen we ons op de informatie en handreikingen die we hebben geboden om de zorgverleners te ondersteunen om een *persoonsgerichte zorg* te bieden die de *autonomie en controle* van mensen met ALS bevordert door het *personaliseren van informatie* aan de individuele behoeften en voorkeuren, *bevorderen van de keuze van de patiënt* en *betrekken van naasten (figuur 1)*. Op basis hiervan hebben we in figuur 2 en 3 de aanbevelingen voor zorgverleners werkzaam in de ALS zorg geformuleerd gericht op een meer persoonsgerichte, holistische zorg. In figuur 4 vatten we tot slot de wetenschappelijke aanbevelingen samen.



Figuur 1 *Persoonsgerichte zorg in ALS*

Algemene aanbevelingen voor zorgverleners

Algemene aanbevelingen

- Bied holistische, persoonsgerichte zorg door mensen met ALS, en hun familie, te betrekken in gedeelde besluitvorming en (vroeg)tijdige, proactieve planning van de zorg; onderzoek en bespreek daarbij hun waarden en behoeften, en personaliseer informatie aan de hand daarvan
- Bevorder de autonomie en eigen regie van mensen met ALS door te benadrukken dat zij hun eigen keuze kunnen maken in hun eigen tempo – wijs daarbij wel op mogelijke nadelen wanneer keuzes te lang worden uitgesteld – en benadruk dat hun keuze gerespecteerd zal worden
- Gebruik besluit- en gesprekshulpen, waar voorhanden, om een meer persoonsgerichte zorg aan te bieden
- Engageer mensen met ALS, en hun mantelzorgers, regelmatig in (vroeg)tijdige planning van hun zorg over behandelopties, vooral waar het compelexe en emotioneel beladen onderwerpen betreft zoals gastrostomie en beslissingen rondom het levenseinde
- Benadruk het belang van (vroeg)tijdige planning van zorg en gedeelde besluitvorming voor een meer persoonsgerichte zorg in de opleiding van neurologen, revalidatieartsen, en andere zorgprofessionals
    - Besteed in de opleiding van zorgprofessionals meer aandacht aan (vroeg)tijdige planning van zorg en gedeelde besluitvorming in een interculturele context

Specifieke aanbevelingen voor zorgverleners

Specifieke aanbevelingen

Persoonlijke prognose

- Bied mensen met ALS, en hun familie, kort na de diagnose de mogelijkheid om een meer persoonlijke prognose te bespreken en personaliseer informatie naar hun waarden en behoeften met behulp van onze handreiking
- Gebruik dit prognostische gesprek als ingang om de toekomst te bespreken, waaronder de zorg in de toekomst, en ook de rol van het ALS zorg team en de steun die zij kunnen bieden

Telehealth

- Bied telehealth oplossingen, waar voorhanden, aan voor het faciliteren van een meer toegankelijke zorg aangepast aan individuele behoeften en voorkeuren, meer ruimte voor zorg op initiatief van de patiënt, en continue monitoring

Gastrostomie

- Focus niet alleen op de klinische voordelen en indicatoren voor gastrostomie, maar onderzoek ook de waarden en voorkeuren van mensen met ALS rondom gastrostomie zodat ze beter ondersteund kunnen worden tijdens het besluitvormingsproces
- Bespreek meerdere keuzeopties – dwz acceptatie, weigering, of uitstel van besluit – als gelijkwaardige en valide opties en ondersteun de keuze van de patiënt

Einde leven beslissingen

- Ga tijdig het gesprek aan met mensen met ALS over (wensen rondom) het einde van hun leven waaronder mogelijke wensen rondom het bespoedigen van het einde

Figuur 3 *Specifiek klinische aanbevelingen*

Aanbevelingen voor toekomstig onderzoek

Onderzoeksaanbevelingen

Algemeen

- Onderzoek de rol van mantelzorgers, zowel volwassenen als kinderen, tijdens (vroeg)tijdige planning van zorg en gedeelde besluitvorming, en hoe zij hierin beter kunnen worden ondersteund

Telehealth

- Maak telehealth en thuis monitoring breder toegankelijk om een meer persoonsgerichte ALS zorg te ondersteunen
  - Evalueer de impact op de kwaliteit van leven, veiligheid en (kosten)effectiviteit om de implementatie van telehealth in ALS zorg op lange termijn te ondersteunen

Persoonlijke prognose

- Ontwikkel predictie-modellen om de snelheid van functieverlies te voorspellen met name voor die aspectedn die de kwaliteit van leven van mensen met ALS het meeste beïnvloeden (bv. lopen, hand functie, spraak, etc)

Gastrostomie

- Onderzoek de klinische voordelen van gastrostomie – bv. de impact op overleving, gewicht en kwaliteit van leven – alsmede de optimale timing van indicatiestelling om mensen met ALS beter te kunnen ondersteunen tijdens het besluitvormingsproces

Einde leven beslissingen

- Doe prospectief onderzoek naar de redenen van mensen met ALS om mogelijk de dood te bespoedigen, vanaf diagnose tot het einde van de ziekte, en onderzoek hoe hun mening verandert om ze beter te kunnen ondersteunen in zowel hun kwaliteit van leven als kwaliteit van overlijden

Figuur 4 *Aanbevelingen voor toekomstig onderzoek*

Dankwoord

Het zit erop, hier is dan het resultaat van jaren hard werk, steun van heel veel mensen, en deelname van talloze betrokkenen. Wat mij vanaf het begin van mijn promotietraject gedragen en geïnspireerd heeft is het enorme optimisme en de vechtlust van mensen met amyotrofische laterale sclerose (ALS) en hun naasten. Je proeft en voelt hun wil om het meeste uit het leven te halen en het beste ervan te maken. Maar daarnaast ook zeker de inzet en betrokkenheid van mijn begeleiders, mede-onderzoekers, en zorgverleners. Jullie allemaal wil ik graag bedanken.

Mensen met ALS en hun naasten

In de eerste plaats wil ik alle mensen met ALS en hun naasten bedanken die hebben deelgenomen aan de studies in dit proefschrift. Het was een voorrecht om zo dichtbij jullie te kunnen komen. Jullie ontroerende, open, soms hartverscheurende en altijd levenslustige verhalen waren voor mij een belangrijke inspiratie. Ik ben enorm dankbaar dat jullie mij binnen hebben gelaten in jullie leven tijdens de interviews over de levensverwachting, gastrostomie en ALS Thuismeten en Coachen. Ik heb zoveel prachtige mensen ontmoet en jullie verhalen hebben mijn leven veranderd. Ik kan me mijn eerste interview over de levensverwachting nog goed herinneren. Tegenover mij zat een enorm positief ingesteld persoon met gevoel voor humor die een hartverscheurend verhaal vertelde over hoe de toekomst, vlak voor pensioen nota bene, overhoop was gegooid. Hier was iemand die met zoveel emotie maar ook optimisme het leven tegemoet trad ondanks de schaduw van ALS die daar nu overheen hing. Mijn ouders zijn van ongeveer dezelfde leeftijd en stonden toen ook vlak voor hun pensioen. En ik heb gelijk na het interview mijn moeder gebeld. Ik wilde even checken of alles nog steeds goed met ze ging.

Uiteindelijk heb ik veel ongelofelijk oprechte, prachtige, emotionele, hartverscheurende verhalen gehoord van mensen met ALS en hun naasten over de impact op hun leven. Maar we hebben regelmatig ook gelachen met elkaar, ALS kreeg jullie niet klein! Dank jullie wel, dit proefschrift is voor jullie.

Promotiecommissie

Beste Anne, Leonard, Anita en Willeke, dank jullie wel voor alle steun de afgelopen jaren.

Prof. Anne Visser-Meily, beste Anne, ik heb de afgelopen jaren met heel veel plezier op de W-afdeling gewerkt. De sfeer was er altijd open, gezellig en hartelijk, terwijl er veel goede zorg werd geleverd en belangrijk onderzoek werd gedaan. Hierin speel jij een belangrijke rol en dat voelde ik ook zo in ons contact. Het was heel fijn om te zien dat je altijd probeerde om de onderzoekers als mens in het oog te houden. Even komen informeren of

alles goed ging of we wel hadden genoten van het weekend, zelf foto's sturen als je weer eens was wezen wandelen op de wadden of ergens anders. Goede, opbouwende feedback op het onderzoek. En altijd de vraag 'wat kan ik hierin voor je betekenen?' Dank je wel voor je steun, je oog voor de mens en je betrokkenheid.

Prof. Leonard van den Berg, beste Leonard, jouw drive binnen de ALS-wereld, zowel binnen Nederland als ver daarbuiten, is legendarisch. Exemplarisch hiervoor is de eerste keer dat ik deelnam aan de Tour du ALS (een benefietevenement in Zuid-Frankrijk waar geld voor ALS-onderzoek wordt opgehaald). We waren net op het vliegveld van Marseille geland en bij de autoverhuurder kwamen we in gesprek met twee dames uit Nederland. Eén daarvan was enkele jaren geleden haar man aan ALS verloren. Ze was helemaal opgetogen om hier onderzoekers van Leonard tegen het lijf te lopen die ze uiteraard kende en van wie ze hoog opgaf. Er lijken niet genoeg uren in de dag of week te zitten voor jouw inzet voor ALS. Dank je wel dat ik die drive heb mogen ervaren en je van dichtbij aan het werk heb mogen zien.

Dr. Anita Beelen, beste Anita, mijn promotietraject is voor ons allebei niet altijd even makkelijk geweest. Je nam na een jaar het stokje over van Carin Schröder en het stond toen nog allerminst vast wat de opzet van mijn promotietraject zou worden. Het heeft dan ook enige tijd gekost voor ons om dit beter in beeld te krijgen, maar ook om elkaar te leren kennen en op waarde te schatten. Ik heb me wel eens afgevraagd hoe ik dit toch ooit tot een succesvol einde zou brengen (misschien jij ook wel), maar je bent me altijd blijven steunen en was er altijd voor me als ik je nodig had. Dit ondanks dat ik van dichtbij mee heb mogen maken hoe ongelofelijk druk jij het altijd hebt. Ik kon er vrijwel altijd op rekenen als ik iets op vrijdag opstuurde je dat in het weekend al gelezen had. Je gedrevenheid en betrokkenheid zijn enorm. Maar ook je oog voor detail en hameren op structuur waren heel belangrijk voor mij. Dank je wel voor alles.

Dr. Willeke Kruithof, beste Willeke, net zoals Jochem en ik "de jongens" waren voor velen, zijn jij en Esther in mijn hoofd altijd "de artsen" geweest. Jij vertolkte (samen met Esther) altijd de klinische blik binnen onze projecten. Wat zeggen en vinden mensen met ALS en hun naasten nu als ze met jou of het team spreken. Dit is ontzettend waardevol voor onderzoekers die anders het risico lopen maar in hun ivoren torentje blijven steken. Daarnaast heb ik jou leren kennen als een heel kritisch maar vooral ook warm persoon met een diep doorleefde roeping om de mensen die bij jou langskomen als mensen te behandelen en hun waarden voorop te stellen. Je praktische, nuchtere humor zullen me ook bijblijven, en de enorme empathie wanneer ik je interviewde over patiënten. Maar ook je behoefte om lekker te kliederen en te tekenen tijdens onze besprekingen over interviewthema's. Geef Willeke een stuk papier en een stift en ze gaat los. Je had nooit veel tijd, je kwam vaak pas later aan bij overleggen en moest dan ook alweer eerder weg omdat je zo vol zat, maar dat is het lot van artsen die niet eens tijd hebben om te lunchen

of naar het toilet te gaan. Desondanks wist je altijd scherpe, opbouwende feedback te geven in de tijd die je wel had. Dank je wel.

Geachte leden van de beoordelingscommissie, prof. Teunissen, prof. Janssens, prof. Seute, prof. Smets, prof. Nollet, heel erg bedankt dat jullie de tijd hebben genomen voor het lezen en beoordelen van mijn proefschrift en om aanwezig te zijn tijdens de promotie.

Co-auteurs

Lieve Loulou, jij kwam voor het eindproject van je master met mij samenwerken op mijn interviewproject over het bespreken van de levensverwachting. Door jouw inzet en frisse houding hebben we hier al snel ONS project van gemaakt. We interviewden samen mensen met ALS en hun naasten, analyseerden de interviews, hadden lange discussies over het coderen en interpreteren van de interviewresultaten en keer op keer schreven we bergen post-its vol om tot de definitieve thema's te komen. En wat waren we onder de indruk en geroerd door de indringende verhalen die zij ons vertelden, we hebben samen met ze gelachen (letterlijk) en gehuild (figuurlijk). Daarnaast deden we samen yoga tijdens onze lunchpauze en wandelden we regelmatig buiten. We hadden een natuurlijke klik, vooral door jouw enorme openheid en innemende persoonlijkheid. Je maakte indruk op me door je heel kwetsbaar naar mij op te stellen, wat voor mij een heel belangrijke les is geweest om mezelf ook kwetsbaarder op te stellen in het leven. Want als je dat durft te doen, krijg je dat ook terug van mensen. Dank je wel dat je mij hebt helpen groeien als mens.

Beste Neele, dank je wel voor al je hulp, inzichten, en enorm prettige samenwerking op mijn interviewproject over besluitvorming rondom gastrostomie. Je was aangenomen op het project als student-assistent, maar zo heeft dat voor mij nooit gevoeld. Samen interviews afnemen, ze bespreken en analyseren. En maar discussiëren over de thema's en wat alles betekende. Regelmatig wandelingen buiten in de natuur rondom het UMCU. Mooie herinneringen. Je wist aan het begin niet zo goed wat je wilde gaan doen na je master, of je het onderzoek in wilde of niet. Maar je bent nu toch aan je eigen PhD-traject begonnen, misschien een beetje geïnspireerd door wat je bij ons op de afdeling hebt gezien en ervaren. Ik weet zeker dat je een heel goede, gedreven onderzoeker bent. Succes ermee, ben benieuwd naar het eindresultaat. En ik beloof je, de publicatie van ons artikel komt eraan, maar het blijkt gewoon super moeilijk om kwalitatieve studies gepubliceerd te krijgen.

Beste Esther, ik heb enorm veel bewondering voor jou als revalidatiearts en mens: super praktisch, heel veel empathie, en altijd oog voor de patiënt als mens. Maar ook heel grappig en scherp, en geen geduld voor mensen die al jaren hetzelfde praatje op congressen afdraaiden. Daarnaast ook zelf gepromoveerd naast al je kliniekwerk en verplichtingen, ik weet niet hoe je het voor mekaar hebt gekregen. Je bent bij heel veel

van mijn projecten betrokken geweest waar al jouw jaren van klinische ervaring enorm waardevol was en met altijd mooie verhalen hoe het in de praktijk eraan toe gaat. Dank je wel voor je betrokkenheid, altijd goedgemutst en met een lach.

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Mede-onderzoekers

Elk jaar wordt in Zuid-Frankrijk de Tour du ALS gereden. Dit is een benefietevenement waarbij honderden mensen de Mont Ventoux opfietsen of oplopen en elk jaar weer meer geld wordt opgehaald om ALS onderzoek mogelijk te maken. De Mont Ventoux is uitgekozen omdat deze nooit afvlakt, het blijft altijd zwaar en omhooggaan, nooit rust; en daarmee staat het symbool voor de het ziektetraject bij ALS. Tijdens de tour komen mensen met ALS, naasten van mensen met ALS of iemand hebben verloren aan ALS, collega's etc. samen om ze te eren en elkaar te steunen. De saamhorigheid van de mensen die hier samen komen is enorm, samen in het verdriet om ALS maar ook het vieren van het leven ondanks ALS. In 2018, 2019 en 2022 heb ik hierbij aanwezig mogen zijn en deelgenomen, en net zoals elke ontmoeting met ALS was dit heel indrukwekkend. Maar vooral ook genieten van het fietsen en de natuur in Zuid-Frankrijk samen met mijn fietsbroeders, mede-onderzoekers en vrienden Ruben, Adriaan en Boudewijn.

Beste Ruben, woorden schieten te kort om jou onderzoeksdrive, kennis van R, medicijntrials, en het ALS-onderzoek te schetsen. Voor iedereen die met jou samenwerkt is het duidelijk dat je het al heel ver hebt geschopt en nog veel verder gaat schoppen. Ongelofelijk veel dank voor alle hulp met R die mij vaak de pet te boven ging maar waar ik me langzaam met jouw steun (en code!) en die van Adriaan iets meer in thuis ging voelen. Uiteindelijk had je natuurlijk ook wel een beetje de plicht om mij te helpen aangezien ik door jou aan R was begonnen i.p.v. in SPSS te blijven steken. Naast je betrokkenheid en werklust in het onderzoek ben je ook een beest op de fiets. Zowel op het vlakke als bergop niet bij te houden. Dank je wel voor de ritten de Mont Ventoux op waarbij je voldoende inhield zodat ik nog net bij je aan kon klampen. Heel veel succes met al je projecten in de toekomst.

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verkoos jij uiteindelijk niet om als onderzoeker door te gaan na je promotie maar om als arts verder te gaan. Misschien had ik hier minder verbaasd over moeten zijn, want ik vond altijd dat jij heel betrokken en zorgzaam over je patiënten sprak. Ik hoop dat je snel een opleidingsplek naar je zin vindt, succes ermee. En ik weet zeker dat je nooit je kritische blik en behoefte aan gedegen onderzoek kwijt zal raken.

Beste Boudewijn, onze altijd vrolijke zuiderbuur (ook al zit ie al jaren weggestopt in een kamertje zonder zonlicht) en een beest op de fiets. Door een boekingsfoutje waren we ooit gedwongen om samen in een bed te slapen in een schattig Frans hotelletje tijdens mijn eerste tour du ALS in 2018. Waar al snel bleek dat jij in staat bent binnen 5 minuten in slaap te vallen, terwijl ik nog uren slapeloos door het hotel en het stadje dwaalde. De tours van 2021 en 2022 zijn we samen naar Zuid-Frankrijk gereden, een autotocht van zeker 15 uur. En alle ode jij reed al die kilometers, want ik had al meer dan 15 jaar geen autogereden. Heel veel dank hiervoor. En nu woon je sinds kort samen met Daisy in Almere. Van harte gefeliciteerd en het is je van harte gegund! Ik ben nog niet op bezoek geweest maar hoop binnenkort een keer aan te komen fietsen.

In de begintijd van mijn promotietraject hadden we een heel grote, heel gezellige groep onderzoekers op de “W-gang” van de revalidatie-afdeling. Zo gezellig dat we nog wel eens commentaar kregen of het niet wat stiller kon want andere mensen probeerden te werken. Excuses hiervoor. Uit deze groep wil ik ook nog veel mensen even (kort) noemen. Beste Jochem, samen zijn we lang geleden begonnen aan ons promotietraject. We werden veelal “de jongens” genoemd, dat was makkelijker dan onze namen onthouden. Terwijl we toch wel erg verschilden qua leeftijd, lichaamsbouw en karakter. In het begin trokken we ook nog veel samen op omdat we toen nog allebei op eHealth en ALS thuismeten en coachen zaten. Samen presentaties geven op voorlichtingsdagen etc. Over de jaren heen zijn we elkaar een beetje uit het oog geraakt, corona speelde hierin een belangrijke rol (en ook de aantrekkingskracht van de Hoogstraat voor jou). Je bent nu alweer een tijdje gepromoveerd en ik hoop dat het je goed gaat, maar met jouw open, ontspannen houding en *can-do* mentaliteit heb ik daar vertrouwen in. Anderen die hier genoemd moeten worden zijn om te beginnen Jessica en Leonhard (Bakker, niet te verwarren met Leonard van den Berg). Beste Jessica en Leonhard, ik kan me nog goed herinneren dat jullie twee Jochem en mij opvingen toen we in het UMCU begonnen. De oude rotten op de gang die ons weg wijs maakten en altijd bereid waren om ons te helpen, aanliepen voor een praatje etc. Ook altijd beschikbaar voor wat “ouderlijk” advies en steun. Dank jullie wel hiervoor. Beste Vincent, jij zorgde ook altijd voor veel gezelligheid en ik was altijd onder de indruk hoe invoelend jij was. Jij zorgde voor wat balans in de groep. Beste Lauriane en Isabelle, hoewel jullie net zo vaak op de Hoogstraat waren als op de W-afdeling was het altijd extra gezellig als jullie er waren. Vooral Jessica was blij dat ze er dan niet weer alleen voor stond tegenover al die onbehouwen mannen. Iedereen is onderhand zijn/haar eigen weg gegaan

en ik hoop dat het jullie allemaal goed gaat. *Last, but not least*, beste Japie, gefeliciteerd met jouw eigen recente promotie. Ik heb je opgewekte houding altijd bewonderd net als het feit dat je je promotie hebt afgerond terwijl je ook als zorgverlener werkte. Complimenten. Daarnaast was ik altijd heel erg onder de indruk als ik jou aan de telefoon hoorde met een patiënt of andere zorgverlener. Je was altijd zo beleefd, helder, en duidelijk in je communicatie, dat ik mijzelf als doel heb gesteld om daarvan te leren. Ik hoop dat je een beetje kan genieten van de rust na je promotie.

Daarnaast wil ik ook graag nog alle zorgverleners bedanken op de W-gang. Ik heb het altijd geweldig gevonden om te kunnen werken op een zorgafdeling, te midden van jullie allemaal. Jullie toewijding was voelbaar en dit heeft me altijd geholpen om te beseffen voor wie wij allemaal werkten en voor wie ik mijn onderzoek deed: de patiënt (en diens familie). Ook wil ik graag nog even Marette en Annemarie bedanken voor alle hulp met het inplannen van afspraken met diverse drukke mensen. En ook Linda voor het contacteren van patiënten voor diverse onderzoeken.

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Vrienden en familie

Lieve Martin, Nanda, Jop, Lieneke en Mimi, totdat corona roet in het eten gooide (voor iedereen) kwamen wij (bijna) maandelijks samen voor onze video-lezing-avondjes (VLA) bij mij thuis. Gestart om samen documentaires en andere interessante video-essays te bekijken en te bediscussiëren, werd het al snel vooral een heel hechte vriendenavond waarbij iedereen zijn/haar wel en wee op tafel kon leggen. Afgewisseld met diepe discussies over wetenschap, psychologie, filosofie, politiek, en alles wat ter tafel kwam. Er werd echt naar elkaar geluisterd en iedereen kon zijn/haar verhaal doen. Iedereen heeft vrienden zoals jullie nodig die nooit oordelen, altijd luisteren, steun en advies bieden zonder mensen te willen veranderen. Heel, heel erg bedankt hiervoor. Ik heb zoveel gehad aan jullie steun en zoveel van jullie geleerd, dit is met geen pen te beschrijven.

Lieve Martin, je hebt de dubieuze eer om mijn oudste vriend te zijn en ik twijfelde dan ook niet om jou als eerst te vragen als mijn paranimf. Ik ken je al vanaf begin 1999 toen ik op studentenkamers kwam wonen in Uilenstede en de knotsgekke bende van afdeling 14. Tijdens al die jaren ben je zoveel verandert en toch ook dat jochie van 19 gebleven die ik daar toen leerde kennen. Jij bent het die me ooit op het pad van evolutietheorie, neurologie en psychologie hebt gebracht. Zonder jou had ik nooit een tweede studie psychologie gaan doen na geschiedenis. En daarmee had ik zonder jou ook nooit aan dit promotietraject begonnen. Het is niet altijd makkelijk geweest over de jaren, maar jij bent me altijd blijven steunen en hebt altijd vertrouwen in me gehad. Daarnaast zijn we ook

verenigd in onze drive om altijd kritisch naar onszelf te blijven kijken en te blijven groeien als mens. Dank je wel voor alles, dat je altijd dicht bij jezelf beng gebleven en tegelijkertijd ook altijd wil blijven groeien.

Lieve Nanda, de afgelopen jaren ben je uitgegroeid tot een heel goede en gewaardeerde vriendin en daarom heb ik je gevraagd mijn tweede paranimf te zijn. Tegenwoordig zien we elkaar bijna tweewekelijks om bij te praten, interessante dingen te bespreken en elkaar te steunen. Ik heb enorm veel bewondering hoe jij het soms uithoudt in gesprekken met Martin en mij, ons tot de orde roept en weer structuur in de chaos aanbrengt. Maar vooral bewonder ik dat je helemaal je eigen lijn trekt in je leven, wars van alle normen en wat mensen denken. En toch sta je altijd open voor input, nieuwe inzichten, en de mening van anderen. Dank je wel voor je onvoorwaardelijke steun, al je hulp, en de manier waarop je mensen (en dus ook mij) het gevoel geeft dat we er mogen zijn om wie we zijn.

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Lieve Citra, dear Citra, as I am writing this we have only known each other for a few months. I want to thank you for the amazing past months that I have known you, for helping me to be better person and making my life a happier and sunnier place.

Voor iedereen die ik ben vergeten om hier te noemen, ik hoop dat jullie het mij kunnen vergeven. Er zijn gewoonweg te veel mensen om te herinneren en te bedanken. Ook jullie bedankt.

About the author

Curriculum vitae

Remko Martyn van Eenennaam was born on March 1st 1980 in Schagen, the Netherlands. He went to secondary school at R.S.G. Wiringherlant and finished his atheneum degree in 1998. Early 1999 he moved to Amsterdam to study at Free University, Amsterdam. After a 2-year detour studying computer science, he received his bachelor degree in medieval history in 2005 and his (research) master (Mphil) in contemporary history in 2011 on the topic of secularisation of catholicism in the Netherlands in the 20th century. Meanwhile, a close friend had got him interested in evolution theory, psychology and neurology. As a result of this newfound interest and because a degree in history is not the best preparation for the job market, Remko decided to pursue a degree in psychology while working 3-4 days a week. In 2016 he received his master degree in healthcare psychology from the Open University, Heerlen. The topic of his master-thesis was quality of life and mental well-being of early cancer survivors using a longitudinal group-based trajectory modeling approach.

With this new degree in psychology, Remko decided to pursue an academic career. In 2017 he was hired as a PhD at the rehabilitaion and neurology department of University Medical Centre, Utrecht, focused on healthcare for people with amytrophic lateral sclerosis (ALS). Although ALS was largely unknown to him before starting his PhD, he quickly found himself fascinated by the disease, inspired by his interaction with people with ALS and their families, and motivated by the scores of dedicated researchers and healthcare professionals surrounding him. During his PhD he was given the opportunity to attend many national and international conferences and present his research there, interact with many amazing dedicated researchers, and conduct and publish studies aimed at improving decision-making and information provision in ALS care. He was also inspired and grateful for his many interactions with people with ALS and their families in the course of his studies, during the tour du ALS, or when presenting his risearch to them during open days.

After having taken a short sabbatical and a well-deserved holiday to Bali, Remko has recently accepted a new job as a postdoc researcher at Amsterdam UMC/VUMC. Here he will develop a model to evaluate the implementation of new projects in palliative care. He is very excited to start on this new chapter in his life and while making use of all the lessons learned over the past decade and a half.

Malaucene France, Tour du ALS 2022

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