FROM MEASURING TRANSPORT TO MEASURING CARE

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Qualitative research on suitable quality indicators for Dutch ambulance service, according to ambulance nurses, drivers, managers and policy advisors

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SUMMARY

The function of the ambulance service is changing from one of transportation to one of care, but quality indicators corresponding to the change in function are lacking in the Netherlands, prompting the following research question: 'What are suitable quality indicators for ambulance service in the Netherlands?' A suitable indicator *aligns with the definition of ambulance service quality, has as many advantages as possible, has as few disadvantages as possible and is preferably evidence based.*

The definition for quality of ambulance service, translated to the Dutch context, is *the degree to which ambulance service, both transport and care, for individuals and populations is consistent with current professional knowledge and minimises mortality and morbidity*. International literature describes 69 quality indicators for ambulance service. Together with four categorisations, quality indicators define seven aspects of ambulance service quality: 'organisation', 'staff', 'material facilities', 'care provision', 'documents & protocols', 'adverse events' and 'patient outcomes'.

Since this research concerns thoughts and opinions, qualitative methods have been used. Data is collected using a literature review, document analysis, semi-structured interviews and observations.

Currently in the Netherlands, seven indicators are implemented and two are used: patient satisfaction and response time. The respondents define five facets of quality of ambulance service: being 'patient centred', 'patient experience', 'skilled staff', 'equipment' and 'transportation'. They want to measure quality through patient satisfaction, prior education accreditation and assessment, amount of restricted procedures performed, the driver style, social skills of nurses and drivers, rate of non-emergency calls and collaboration with the care chain. The disadvantages of quality indicators that the respondents see are administrative burden, decoupling, distrust, injustice and waste of resources. The advantages are benchmarking, improvement of care and practice-based evidence.

The only aspect that science, policy and clinical practice agree upon is patient outcomes, with patient satisfaction as a quality indicator. Five indicators are mentioned in the international literature and by ambulance nurses, drivers, managers and policy advisors: rate of non-emergency calls, prior education, accreditation, assessment of ambulance personnel and patient satisfaction. These indicators correspond with three of the seven aspects of quality: 'organisation', 'staff' and 'patient outcomes'. This set forms a promising starting point for a process of defining suitable quality indicators in the Dutch ambulance service context, measuring the key concepts of quality, that are evidence based and applicable in practice.

TABLE OF CONTENT

1. INTRODUCTION

1.1 PROBLEM ANALYSIS

The function of ambulance service is changing. Whereas ambulances used to function only as transportation, they are now more functioning as a part of the care chain (1). The main goal of ambulance service is still transporting patients; however, the medical care that is given in an ambulance is seen as increasingly important and potentially lifesaving (2, 3). Giving the right medical interventions to patients in the early stages of trauma can reduce morbidity and mortality (2). Therefore, ambulances are now equipped and staff are trained to stabilise potential trauma patients (4-8).

This change in the function of ambulance service indicates that the definition of quality of ambulance service is also changing. This raises the question of how quality of ambulance service currently is defined, and whether the definition focuses on patient transportation, delivering care, or a combination of both. Whatever the outcome of this question may be, it is certain that this change in function has altered the perception of quality of care and how to ensure it (1, 5, 9).

In the Netherlands, laws such as the Temporary Ambulance Care Act, Healthcare Facilities Quality Act and Individual Healthcare Professions Act ensure the quality of Dutch ambulance service (10, 11). In addition, protocols and guidelines assure the quality of ambulance service, as they elaborate the professional standards for its content and processes (10). Qualified personnel, nurses and drivers licenced to deliver medical treatment, also ensure the quality of the ambulance service. Furthermore, there is a registration procedure for complaints and incidents in Dutch ambulance service (10).

Although ambulance service quality is perceived as important and the quality of Dutch ambulance service is ensured in various ways, quality indicators for ambulance service corresponding to the change in function are lacking. Most of the research on quality indicators in ambulance service conclude that good indicators are missing and that such quality indicators are needed (1, 3-5, 8, 12, 13). Most of this research focuses on countries other than the Netherlands (1-8, 12-20), and there is a limited amount of literature about Dutch ambulance service (10, 11, 21). Of these, only one article discusses a potential quality indicator, measuring lactate level, which is not commonly used (21).

One quality indicator used almost universally for ambulance service is response time (1, 3-5, 8, 17, 18). However, response time is a limited quality indicator which focuses solely on the transport portion of ambulance service and neglects the medical or care portion. Furthermore, the literature expresses doubt regarding the contribution of response time to better patient outcomes (22-24).

From other care systems, such as hospital care and youth care, we know that quality indicators can contribute to the improvement of a health service. Hence, a lack of quality indicators has the potential to stagnate the improvement of ambulance service quality (3, 25).

The transition from measuring the quality of transport to measuring the quality of care is a current issue. The Dutch umbrella organisation, *Ambulancezorg Nederland* (AZN), is currently developing indicators other than response time to measure ambulance service quality (8, 26). Since there is an urgent need for suitable quality indicators in Dutch ambulance service, research on quality indicators in Dutch ambulance service is important.

1.2 OBJECTIVE & RESEARCH QUESTIONS

Quality indicators can help to improve care. For the most part, ambulance service quality is currently measured based on response time, which measures the transport portion of ambulance service. However, there has been a shift in the consideration of ambulance service: from a focus on transport to a focus on care. Therefore, response time alone no longer covers the entire scope of ambulance service quality and additional, suitable quality indicators are needed. The literature on potentially suitable quality indicators in the Dutch ambulance context is insufficient; therefore, the aim of this research is to explore suitable quality indicators for Dutch ambulance service. This topic is investigated through the following the research question:

What are suitable quality indicators for ambulance service in the Netherlands?

Suitable quality indicators in ambulance service have several key characteristics: they are specific, sensitive, valid and reliable. The indicators are also relevant for and applicable to clinical practice (8, 25). In this research, I define a suitable quality indicator as one that: *aligns with the definition of ambulance service quality, has as many advantages as possible, has as few disadvantages as possible and is preferably evidence based* (8, 25).

To research suitable quality indicators, it is important to know which are already commonplace in the ambulance service context. This can be achieved by surveying the indicators being used internationally, in answer to the first sub-question:

1. *What ambulance service quality indicators are described in international literature?*

Before researching new circumstances, it is necessary to consider the current context. In this case, it is important to know what policies and indicators are currently used to measure Dutch ambulance service quality. To achieve this, the second sub-question will be answered:

2. *What quality indicators are currently used for ambulance service in the Netherlands?*

The nurses, drivers, managers and policy advisors who work every day to provide ambulance service have professional opinions on what constitutes quality and what suitable quality indicators for ambulance service are. As a result, they can offer an insight into how indicators fit into daily practice. This is studied in the third sub-question:

3. *What do ambulance nurses, drivers, managers and policy advisors experience as important to the delivery of quality of ambulance service, and how do they think that can be measured?*

It is also essential to understand how indicators fit into current ambulance service practice to determine their suitability. To judge this, it is valuable to know what professionals in ambulance service perceive the potential consequences of these indicators to be. Therefore, this is the subject of the fourth sub-question:

4. *What are the disadvantages and advantages of potential quality indicators for Dutch ambulance service according to ambulance nurses, drivers, managers and policy advisors?*

Six chapters make up this thesis. In Chapter 2, I describe the main theoretical perspectives on ambulance service quality and its indicators. In Chapter 3, I explain the methodical approaches used for this research. Chapter 4 describes the main findings. In Chapter 5, I give a conclusion on the suitable quality indicators for ambulance service. I end the thesis in Chapter 6, with a discussion comparing the results with the literature and offer a critical view of this research.

2. THEORETICAL FRAMEWORK

In this chapter, I describe the theoretical background to my research in a literature review. The first section discusses views on and aspects of ambulance service quality. In the second section, I give an overview of the quality indicators that described in the international literature. In the last section, I critically reflect on the quality indicators for ambulance service.

2.1 QUALITY OF AMBULANCE SERVICE

Before taking a measurement, it is logical to define the subject being measured. However, ambulance service quality is rarely defined (2, 4, 8, 13). The Institute of Medicine (IOM) defines care quality as follows (27): *'the degree to which health services for individuals and populations increase the likelihood of desired health outcomes and are consistent with current professional knowledge'*, and this is used as starting point in some articles on the ambulance service quality (5, 9, 28). Applying the IOM definition to the Dutch ambulance service context, the definition becomes: *the degree to which ambulance service, both transport and care, for individuals and populations is consistent with current professional knowledge and minimises mortality and morbidity*. This definition guides this research.

To understand the ambulance service context, it is important to know that the Netherlands has two types of ambulance service: emergency and planned care, each with different functions and maximum response times. Two thirds of the service is emergency care, which is divided into A1 and A2 urgency types. A1 urgency concerns life-threatening cases and the maximum response time is 15 minutes. A2 urgency relates to cases that are non-life-threatening but require a fast response, and ambulances must be on site within 30 minutes of the emergency call. Non-emergency care is labelled B-transport; this conveys a patient from one care facility to another and has no time indicator (10). Since A and B types differ in function, what people consider good care quality and the required quality indicators may also differ. In this research, I focus on the A and B types, and bear these differences in mind.

DIMENSIONS OF QUALITY OF AMBULANCE SERVICE

Although a clear definition of ambulance service quality is absent in most of the literature, there are published attempts to describe ambulance service quality by distinguishing dimensions of it. I will describe four categorisations made by the National Council for Public Health (NRV) (A), IOM (B), AZN (C) and Murphey et al. 2016 (D) (5, 8, 27, 29-33).

According to the NRV, the quality of the professional practice and of the institution should be considered to judge quality of care. Professional practice can be divided three dimensions:

the quality of methodical-technical practice (I), attitude of the professional (II) and organisation of professional practice (III). The quality of the institution has four dimensions: quality of the organisation (IV), employees (V), material facilities (VI) and care provision (VII) (30, 32, 33).

The IOM describes six dimensions of quality care, stating that it should be safe (I), effective (II), patient centred (III), timely (IV), efficient (V) and equitable (VI) (5, 27, 31). These dimensions have been used to assess the quality of ambulance service (34).

The AZN suggests eight dimensions that could serve as quality indicators for ambulance service. These are as follows: expert, skilled and committed staff (I); client satisfaction (II); the number of complaints and how the regional ambulance service deals with them (III); cooperation with chain partners (IV); the degree of innovative healthcare (V); logistical results (VI); the organisation of planned care (VII); and the way the ambulance service is managed (VIII) (29). The AZN's categorisation overlaps with the previous two, but also contains some new dimensions.

Murphy et al. have concluded that indicators for ambulance service can be categorised into eight dimensions: person-centred care and support (I); effective care and support (II); safe care and support (III); better health and wellbeing (IV); leadership, governance and management (V); workforce (VI); use of resources (VII); and use of information (VIII) (8).

The variety of dimensions in these four publications illustrates that there is no single view on ambulance service quality. However, there is some overlap in the dimensions used. I made a schematic overview of how these categorisations are connected (Table 1).

To structure and present this information, I introduced four aspects of quality for ambulance service: organisation, staff, material facilities and care provision. I colour-coded these aspects (Table 1): 'organisation' is dark blue; 'staff' and related dimensions are yellow; 'material facilities' is red; and 'care provision' is turquoise. The dimensions that are not sorted into aspects have a grey colour code.

Table 1: Aspects of quality of ambulance service

Aspects	NRV	IOM	AZN	Murphy et al
Organisation	-Organisation -Organisation of professional practice		-Logistical results -The organisation of planned care -The way the ambulance service is managed -Cooperation with chain partners	-Leadership, governance and management
Staff	-Employees -Methodical-technical practice -Attitude of the professional		-Expert, skilled and committed staff	-Workforce
Material facilities	-Material facilities			-Use of resources
Care provision	-Care provision	-Safe -Effective -Patient centred -Timely -Efficient -Equitable		-Person-centred care and support -Safe care and support -Effective care and support
Undefined			-Client satisfaction -The number of complaints and how the regional ambulance service deals with them -The degree of innovative healthcare	-Use of information -Better health and wellbeing
Dark blue: organisation, yellow: staff, red: material facilities, turquoise: care provision, grey: undefined				

In Chapter 1, I defined a suitable quality indicator as one that *aligns with the definition of ambulance service quality, has as many advantages as possible, has as few disadvantages as possible and is preferably evidence based.*

Based on the four abovementioned publications, a complete set of quality indicators should at least cover all the following aspects of ambulance service quality: ‘organisation’, ‘staff’, ‘material facilities’, and ‘care provision’.

Based on the definition of good ambulance service as *the degree to which ambulance service, both transport and care, for individuals and populations is consistent with current professional knowledge and minimises mortality and morbidity*, it is strange that none of the publications mentioned ‘adverse events’ (mortality and morbidity) and in line with current professional knowledge the attention for patient outcome related themes is rather small.

2.2 QUALITY INDICATORS FOR AMBULANCE SERVICE

Based on the previously defined aspects of ambulance service quality and the dimensions described, we can start looking for suitable quality indicators.

An indicator can have four functions. First, it can be a measure, a variable of a performance or part of a process that can be quantified and measured. Second, it can be a target, a

measured value that indicates if the performance is satisfactory or unsatisfactory. Third, it can be a measurement tool, the instrument that determines the characteristics of the indicator. Fourth, it can be a registration technique, the way observed data is documented (25, 30). Since indicators can function in four ways, the function that the indicators in Dutch ambulance service can be chosen based on the preferences of the actors in Dutch ambulance service.

International literature describes promising theory-based indicators, not yet used in practice, as well as indicators already in use. To get a good overview of this field, I conducted a review of the available literature on quality indicators in ambulance service and combined the corresponding indicators. In addition, I clustered and grouped the indicators.

I clustered the indicators as generic (Table 3) and disease specific (Table 4), because both types are used in ambulance service and described in the literature (1, 4-6, 8, 15, 16). Generic quality indicators can be used for various diseases. Disease-specific quality indicators can be used for a single disease (25). I begin with a description of generic quality indicators, after which I describe the disease-specific quality indicators.

Since the groupings structure, process and outcome are also often used in ambulance literature, I grouped the quality indicators accordingly (Tables 3 and 4) (5-8, 12, 18). This grouping is based on the ideas of Donabedian (35). Structure indicators measure the attributes of the healthcare setting. Process indicators measure what is really done when delivering care to the patient. Outcome indicators measure the changes in the patients situation at the end of the process (25, 28, 35, 36).

GENERIC QUALITY INDICATORS

International literature describes 43 generic quality indicators (Table 3). I combined indicators when multiple articles described the same indicator and then I assigned each indicator to a group (structure, process or outcome). In addition, I sorted the quality indicators based on the aforementioned aspects of ambulance service. In the following tables, I colour-coded these aspects: dark blue for ‘organisation’, yellow for ‘staff’, red for ‘material facilities’, turquoise for ‘care provision’.

Since some indicators did not fit into these four aspects, I added three additional aspects, based on the indicators and previously undefined dimensions from the literature. These aspects concern: ‘adverse events’ such as mortality and morbidity, the number of complaints and how regional ambulance service deals with them; the description of professional knowledge in the form of ‘documents & protocols’; and ‘patient outcomes’, such as the AZN’s dimension, client satisfaction, and Murphy et al.’s dimension, better health and wellbeing.

These three aspects fill the previously mentioned gaps of the IOM definition of quality of care. The colour-codes for these are green for 'documents & protocols', orange for 'adverse events' and pink for indicators related to 'patient outcomes'. The only dimension that is not covered by other dimensions or indicators is the degree of innovative healthcare (Table 2).

Table 2: Extended list of aspects of quality of ambulance service

Aspects	NRV	IOM	AZN	Murphy et al
Organisation	-Organisation -Organisation of professional practice		-Logistical results -The organisation of planned care -The way the ambulance service is managed -Cooperation with chain partners	-Leadership, governance and management
Staff	-Employees -Methodical-technical practice -Attitude of the professional		-Expert, skilled and committed staff	-Workforce
Material facilities	-Material facilities			-Use of resources
Care provision	-Care provision	-Safe -Effective -Patient centred -Timely -Efficient -Equitable		-Person-centred care and support -Safe care and support -Effective care and support
Documents & protocols				-Use of information
Adverse events			-The number of complaints and how the regional ambulance service deals with them	
Patient outcomes			-Client satisfaction	-Better health and wellbeing
Undefined			-The degree of innovative healthcare	

dark blue: organisation, yellow: staff, red: material facilities, turquoise: care provision, green: documents & protocols, orange: adverse events, pink: patient outcomes, grey: undefined

STRUCTURE

Structure indicators are grouped into four aspects and consist of 11 indicators (Table 3). The first aspect is 'organisation'. The two indicators of this aspect describe whether the ambulance services are accessible for patients and whether there are leaders available when there are major casualties. These two indicators are not used in practice, but are recommended. In one article no positive and no negative evidence is found for accessibility, in the other two articles strong positive evidence is found for these two indicators (5, 8, 12).

The second structure aspect, 'staff', consists of two indicators. These indicators measure the education, training and annual appraisal of ambulance personnel. Education is a recommended indicator in some articles and used in practice in others. The rate of evidence in these articles is no negative and no positive evidence to strong positive evidence (4-8). Appraisal of practitioners is recommended with strong positive evidence (8).

‘Material facilities’ is the third aspect of structure. The two corresponding indicators relate to the availability of drugs and equipment on the ambulances. These quality indicators are used in practice, however no evidence was found (4, 5).

The last aspect of the structure indicators is ‘documents & protocols’. The five indicators of this aspect concern the availability of and access to documents and protocols. The two indicators availability of dispatch criteria and availability of protocols are used in practice, with no positive and no negative evidence (6). The other three indicators, access to electric medical education resources, performance measurement data and clinical audit rate of patient care report forms, are recommended with strong positive evidence (8).

PROCESS

The process indicators can be divided into fourteen indicators and four aspects (Table 3). ‘Care provision’ is the first aspect and consists of six indicators. The first two indicators of ‘care provision’ concern whether ambulances transport the patients to the correct facility. In the work of El Sayed, it is used in practice, with no positive and no negative evidence (5). Coleman and Nicholl recommended this indicator with strong positive evidence (12). The last four indicators of ‘care provision’ concern whether a clinical measurement is made. The evidence for measuring lactate level is slightly positive, for blood pressure and heart rate it is not positive and not negative, for pain score is both not positive and not negative and strongly positive and for patient satisfaction is strongly positive (6, 8, 21). Measuring patient satisfaction is the only indicator that is not used in practice (6, 8, 21).

The second aspect, ‘documents & protocols’, consists of four indicators. The first three indicators relate to patterns of protocol usage and adherence to guidelines. There is no positive and no negative evidence available for the patterns of protocol usage, however this quality indicator is used in practice (5, 19). Adherence to guidelines and appropriate intervention with pain are recommended, with strong positive evidence (8, 12). The fourth indicator, completeness of clinical documentation, is recommended, with strong positive evidence, and is used in practice, without any positive or negative evidence (5, 8, 19).

Aspect three, ‘adverse events’, entails one indicator: the rate of patient injuries during emergency care. This is recommended with strong positive evidence (8).

‘Staff’ is the last aspect of the process and consists of three indicators: occupational injuries, staff satisfaction and staff absenteeism. All three are recommended indicators with strong positive evidence (5, 8).

OUTCOME

The outcome indicators are divided into four aspects, consisting of 18 indicators (Table 3). The first aspect ‘care provision’ is divided into four time-related and two clinical-outcome-related indicators. Response time and prehospital time are used in practice with minor negative to minor positive evidence (1, 4-6, 8, 18, 20). The time between calling and being treated and the time for completed patient handover to an emergency department are recommended indicators, with strong positive evidence (8, 12). The last two indicators measure how successful a medical intervention was: oxygen saturation improvement and successful intubations. Both are recommended indicators, with strong positive evidence (8).

‘Patient outcomes’ is the second aspect and consists of three indicators. These indicators are all used in practice. Long term patient outcomes has no positive and no negative evidence, improvement in pain score has no positive and no negative evidence in one article and strong positive evidence in another and patient satisfaction has minor positive to strong positive evidence (5-8, 14, 19).

The third aspect is ‘adverse events’. The eight corresponding indicators concern three mortality and five other ‘adverse events’ indicators. All pre-hospital or in-hospital deaths are indicators used in practice, with no positive or negative evidence found (6, 15, 21). The mortality rate for diseases where well-performing emergency services could improve a patient’s chance of survival is a recommended indicator, with strong positive evidence (12). The preventable deaths indicator is used in practice with minor positive to strong positive evidence (6, 37). The last five indicators concern other ‘adverse events’. Complaint rate, ambulance road traffic collision rate, rate of adverse events and assaults on pre-hospital practitioners are recommended indicators with a strong positive level of evidence (5, 8). Patients that are admitted to the hospital after being left at the scene inappropriately is used in practice and the evidence is not researched (19).

The last aspect is ‘material facilities’. This has one recommended indicator: healthcare costs per capita. There is no evidence researched for this indicator (5).

Table 3: Generic quality indicators grouped in structure, process and outcome
Coded on aspects of quality of ambulance service

Group	Aspect	Quality Indicator	Author	Recommended	Practice	Evidence	Country
STRUCTURE	Organisation	Proportion of population living within 10 kilometres of emergency or urgent care facilities open for more than 12 hours per day and 7 days per week.	Coleman & Nicholl 2012; El Sayed 2012	X		++; +/-	UK Lebanon
		Rate of on-scene clinical / operational leader for incidents where 3 or more ambulances have been tasked, or the presence of 5 or more casualties	Murphy et al 2016	X		++	Ireland
	Staff	Training and education of the ambulance personnel	Baqir & Ejaz 2011; Gruen et al 2012; Melby & Ryan 2005; El Sayed 2012; Murphy et al 2016	X	X	0; +/-; +; +/-; ++	Pakistan Canada UK Lebanon Ireland
		Rate of annual clinical appraisal of practitioners	Murphy et al 2016	X		++	Ireland
	Material facilities	Availability of equipment	Baqir & Ejaz 2011; El Sayed 2012		X	0; +/-	Pakistan Lebanon
		Availability of life saving drugs and oxygen	Baqir & Ejaz 2011		X	0	Pakistan
	Documents & Protocols	Availability of dispatch criteria	Gruen et al 2012		X	+/-	Canada
		Availability of protocols	Gruen et al 2012		X	+/-	Canada
		Access to electronic / online medical education resources	Murphy et al 2016	X		++	Ireland
		Access to performance measurement data	Murphy et al 2016	X		++	Ireland
		Clinical audit rate of patient care report forms	Murphy et al 2016	X		++	Ireland
PROCESS	Care Provision	Transport to appropriate facility	El Sayed 2012; Coleman & Nicholl 2012	X	X	+/-; ++	Lebanon UK
		Arrivals at EDs referred by emergency ambulance and discharged without treatment or investigations(s) that needed hospital facilities.	Coleman & Nicholl 2012	X		++	UK
		Measuring lactate level	Jansen et al 2008		X	+	the Netherlands
		Measuring blood pressure and heart rate	Jansen et al 2008		X	+/-	the Netherlands
		Measuring pain score	Gruen et al 2012; Murphy et al 2016	X	X	+/-; ++	Canada Ireland
		Measuring patient satisfaction with survey	Murphy et al 2016	X		++	Ireland
	Documents & Protocols	Frequency and patterns of protocol usage	Snooks et al 2004; El Sayed 2012		X	0; +/-	UK Lebanon
		Adherence to evidence-based good practice guidelines	Coleman & Nicholl 2012; Murphy et al 2016	X		++; ++	UK Ireland
		Rate appropriate intervention with acute pain	Murphy et al 2016	X		++	Ireland
		Completeness of clinical documentation	Snooks et al 2004; El Sayed 2012; Murphy et al 2016	X	X	0; +/-; ++	UK Lebanon Ireland
	Adverse events	Rate patient injuries during EMS phase of care (e.g. fall from stretcher)	Murphy et al 2016	X		++	Ireland
	Staff	Incidence of occupational injuries and illnesses	El Sayed 2012; Murphy et al 2016	X		0; ++	Lebanon Ireland
		Staff satisfaction rate	Murphy et al 2016	X		++	Ireland
		Staff absenteeism rate per year	Murphy et al 2016	X		++	Ireland

Group	Aspect	Quality Indicator	Author	Recommended	Practice	Evidence	Country
OUTCOME	Care Provision	Response time	Murphy et al 2016; Siriwardena et al 2010: El Sayed 2012; Baqir & Ejaz 2011; Heath & Radcliffe 2007		X	-; +/-; -; 0; -	Ireland UK Lebanon Pakistan
		Total prehospital time (with component parts)	Gruen et al 2012; Di Bartolomeo et al 2007		X	+/-; +	Canada Italy
		Time between calling and being treated	Coleman & Nicholl 2012	X		++	UK
		Average time interval of completion patient handover on ED arrival	Murphy et al 2016	X		++	Ireland
		Rate of successful endotracheal intubation	Murphy et al 2016	X		++	Ireland
		Rate of oxygen saturation improvement post O2 administration	Murphy et al 2016	X		++	Ireland
	Patient outcomes	Patient Satisfaction	El Sayed 2012; Johansson et al 2011; Melby & Ryan 2005; Snooks et al 2004; Murphy et al 2016	X	X	+; +; +; +; ++	Lebanon Sweden UK
		Improvement in pain score	El Sayed 2012; Murphy et al 2016	X	X	+/-; ++	Lebanon Ireland
		Long term patient outcomes	Gruen et al 2012		X	+/-	Canada
	Adverse events	Pre-hospital deaths/ In-hospital deaths	Jansen et al 2008; Seymour et al 2012; Gruen et al 2012		X	0: 0; +/-	the Netherlands USA Canada
		Mortality rates / Case fatality ratios for serious, emergency, conditions for which a well-performing EUCS could improve chances of survival.	Coleman & Nicholl 2012	X		++	UK
		Peer review for preventable deaths	Chiara et al 2002; Gruen et al 2012		X	++; +	Italy Canada
		Complaint rate of overall patient interactions	Murphy et al 2016	X		++	Ireland
		Ambulance road traffic collision rate on AS1 Emergency Call	Murphy et al 2016	X		++	Ireland
		Assault on pre-hospital practitioner per 10000 hours worked	Murphy et al 2016	X		++	Ireland
		Number of patients admitted to hospital within 14 days of their emergency ambulance attendance who were judged to have been inappropriately left at the scene by their attending crew	Snooks et al 2004		X	0	UK
		Rate of adverse events	El Sayed 2012; Murphy et al 2016	X		0; ++	Lebanon
	Material facilities	Healthcare cost per capita	El Sayed 2012	X		0	Lebanon

Evidence: -- strong negative, - minor negative, +/- no positive and no negative, + minor positive, ++ strong positive, 0 no research done; **colour-codes**: dark blue: organisation, yellow: staff, red: material facilities, turquoise: care provision, green: documents & protocols, orange: adverse events, pink: patient outcomes

DISEASE-SPECIFIC QUALITY INDICATORS

In addition to generic quality indicators, the literature describes disease-specific indicators. Table 4 presents clinical bundles of 12 diseases, which all have structure, process and/or outcome indicators specific to that disease. Since all of these indicators fall under the aspect 'care provision', the entire table is colour-coded turquoise.

STRUCTURE

There are structure indicators for four clinical bundles. The structure indicator for cardiac arrest is used in practice with strong positive evidence (5, 8, 16, 18). The structure indicators for spinal cord injury, STEMI and pulmonary oedema are recommended indicators with a strong positive evidence (5).

PROCESS

Twelve clinical bundles have process indicators. Cardiac arrest, stroke or TIA, acute asthma, hypoglycaemia and STEMI have process indicators that are recommended and used in practice. The indicators for AMI are used in practice. The care bundles spinal cord injury, trauma, seizure, sepsis, paediatric and pulmonary oedema have recommended indicators. All the process quality indicators have strong positive evidence (5, 8, 16-18).

OUTCOME

Disease-specific outcome indicators are described for ten clinical bundles. The indicators for cardiac arrest are recommended and used in practice with minor positive to strong positive evidence (5, 8, 38). The outcome indicator for AMI is used in practice with strong positive evidence (17). Stroke or TIA, seizure, hypoglycaemia, STEMI, pulmonary oedema, acute asthma, trauma and sepsis have indicators that are recommended. For the sepsis indicator the level of evidence is not researched (15). The other indicators have strong positive evidence (5, 8, 17, 38).

Table 4: Disease specific quality indicators, grouped in Structure, Process, outcome
Coded on aspects of quality of ambulance service

Group	Clinical bundle	Author	Recommended	Practice	Evidence	Country
Structure	Cardiac arrest	Murphy et al 2016; El Sayed 2012; Siriwardena et al 2010;	X	X	++; ++; ++	Ireland Lebanon UK
	Spinal cord injury	Ahn et al 2011	X		++	Canada
	ST elevation myocardial infarction (STEMI)	El Sayed 2012	X		++	Lebanon
	Pulmonary oedema	El Sayed 2012	X		++	Lebanon
Process	Cardiac arrest	Murphy et al 2016; El Sayed 2012; Siriwardena et al 2010;	X	X	++; ++; ++	Ireland Lebanon UK
	Stroke / TIA	Murphy et al 2016; El Sayed 2012; Siriwardena et al 2010; Siriwardena 2014	X	X	++; ++; ++; ++	Ireland Lebanon UK
	Acute asthma	Murphy et al 2016; El Sayed 2012; Siriwardena et al 2010;	X	X	++; ++; ++	Ireland Lebanon UK
	Hypoglycaemia	Murphy et al 2016; El Sayed 2012; Siriwardena et al 2010;	X	X	++; ++; ++	Ireland Lebanon UK
	ST elevation myocardial infarction (STEMI)	Murphy et al 2016; El Sayed 2012; Siriwardena et al 2010;	X	X	++; ++; ++	Ireland Lebanon UK
	Acute myocardial infarction (AMI)	Siriwardena 2014		X	++	UK
	Spinal cord injury	Ahn et al 2011	X		++	Canada
	Trauma	Murphy et al 2016; El Sayed 2012	X		++; ++	Ireland Lebanon
	Seizure	Murphy et al 2016; El Sayed 2012	X		++; ++	Ireland Lebanon
	Sepsis	Murphy et al 2016	X		++	Ireland
	Paediatric	Murphy et al 2016	X		++	Ireland
	Pulmonary oedema	El Sayed 2012	X		++	Lebanon
Outcome	Cardiac arrest	Murphy et al 2016; El Sayed 2012; Perkins & Cooke 2012	X	X	++; ++; +	Ireland Lebanon UK
	Acute myocardial infarction (AMI)	Siriwardena 2014		X	++	UK
	Stroke / TIA	El Sayed 2012	X		++	Lebanon
	Seizure	Murphy et al 2016; El Sayed 2012	X		++; ++	Ireland Lebanon
	Hypoglycaemia	Murphy et al 2016; El Sayed 2012	X		++; ++	Ireland Lebanon
	ST elevation myocardial infarction (STEMI)	El Sayed 2012	X		++	Lebanon
	Pulmonary oedema	El Sayed 2012	X		++	Lebanon
	Acute asthma	El Sayed 2012	X		++	Lebanon
	Trauma	El Sayed 2012	X		++	Lebanon
	Sepsis	Seymour et al 2012	X		0	USA

Evidence: -- strong negative, - minor negative, +/- no positive and no negative, + minor positive, ++ strong positive, 0 no research done; turquoise = care provision

Based on the assumption that quality indicators should align with the definition of quality of ambulance service, to cover the whole scope of ambulance service at least seven indicators are needed to measure quality, one for every aspect. In line with this assumption, it seems

logical to multiply the number of aspects by three (based on structure, process and outcome) to reach the minimum number of indicators needed.

However, striving for comprehensiveness would result in a quality system that was administratively unfeasible (39). Therefore, a lean system is more appropriate.

Some aspects are not suited for every group. For example, ‘patient outcomes’ is an aspect that is suited to measuring outcomes, but not suitable for measuring if something is available. Therefore, ‘patient outcomes’ is not appropriate as a structure indicator.

Instead of using disease-specific indicators as a loose set of indicators, they can be combined with the generic indicators. The disease-specific indicators are used as an addition to the corresponding generic indicators. Distinctions between diseases can be made later, when necessary.

In addition, it is impractical to measure all elements continuously. For example, the availability of dispatch criteria can be measured once a year, while improvement in pain score can be measured continuously. Therefore, the measuring frequency for these indicators should differ depending on the indicator.

In summary, it is advisable to use the indicators in combination. Instead of measuring all elements, measurements are made when necessary and appropriate. The generic indicators constitute the foundation and the disease-specific indicators complement these when necessary.

2.3 IMPORTANT INDICATORS

International literature most often cites the three generic indicators for the quality of ambulance service: training and education of ambulance personnel, response time and patient satisfaction. These indicators are mentioned in five articles and are also used most often in practice.

Remarkably, the level of evidence varies between these three most frequently used indicators. Patient satisfaction has the strongest level of evidence with positive evidence in all of the articles. Training and education has weaker evidence: one article where evidence was not researched, one article where no positive no negative evidence was found, one article with minor positive evidence and one article with strong positive evidence. In the literature, the evidence for response time is even less, it is absent or even has minor

negative evidence. This shows that the effect of response time on ambulance service quality is questionable (1, 4, 5, 8, 10, 18, 22-24, 40, 41).

To be evidence based, the response time should be disease specific, and therefore linked to a disease on which response time has an impact (5, 8, 18, 38). For example, to improve the chances of survival for patients with a cardiac arrest, the response time should be around 4 minutes. This is much lower than the generic 15 minutes used in the Netherlands (1, 4, 5, 8, 10, 18, 22-24, 38, 40, 41).

Mortality is a frequently discussed and commonly used indicator in ambulance service (6, 12, 15, 21-24, 37, 42). Mortality relates directly to the definition of good ambulance service. However, mortality gives a limited view of ambulance service (42). Pre-hospital and in-hospital deaths are not evidence based (6, 15, 21), but there is evidence for preventable mortality indicators: mortality that can be prevented or diseases for which emergency care can make a difference in the survival rate (6, 12, 37).

Three articles reference completeness of clinical documentation. Despite the strong positive evidence for the suggestion of this indicator, evidence is lacking in articles where the indicator is used in practice (5, 8, 19).

The most frequently described disease-specific indicators are the process indicators for stroke and TIA. In the UK, this bundle is also tested in practice (17, 18). The UK also uses indicators for cardiac arrest, acute asthma, hypoglycaemia, STEMI and AMI (17, 18). Aside from AMI, these are the most frequently described clinical bundles in the literature. Although the disease-specific indicators all have strong positive evidence, they are only suggested for other countries and diseases (5, 8, 15, 16).

The most described indicators are linked to the definition *the degree to which ambulance service, both transport and care, for individuals and populations is consistent with current professional knowledge and minimises mortality and morbidity*. Response time is focused on the transportation portion of ambulance service. The other indicators focus on the care portion. Current professional knowledge is covered by the training and education of ambulance personnel. Minimising of mortality and morbidity is measured by mortality, the disease-specific indicators and patient satisfaction as a patient outcome. Completeness of clinical documentation is not connected to this indicator. Completeness links to improving the quality of care for educational purposes and intervision, but not to the delivery of care.

Although these indicators fit within the definition of ambulance service quality and are the most frequently described and used, evidence for their practical value is for the most part

lacking. In addition, it is unknown whether these indicators correspond to what ambulance service nurses, drivers, managers and policy advisors want to measure.

2.4 CRITICAL REFLECTION ON QUALITY INDICATORS

I stated early on that based on the assumption that quality indicators align with the definition of ambulance service quality, at least seven indicators are needed to measure the whole scope of it, one for every aspect.

Looking more critically at the indicators mentioned in the literature, it is unclear whether the described indicators cover the aspect comprehensively or measures the essential nature of this aspect. For example, organisation is a broad aspect, but only two specified indicators are described in the literature. The indicator ‘rate of on-scene clinical or operational leaders for incidents where three or more ambulances have been tasked, or the presence of five or more casualties’ only partially covers the aspect organisation (5, 8, 12). It does not represent the essence of the aspect ‘organisation’. Therefore, a critical reflection on the significance of the indicator to the essence of the aspect is necessary.

Thereby is no to weak negative evidence for the relation between quality indicator scores and good ambulance service in relation to mortality and response time (1, 4-6, 8, 15, 18, 21). These indicators may seem linked to the essence of ambulance service, but proof of their ability to measure this quality is lacking, so they may not function in this role.

In addition, more than half of the generic indicators (24 out of 43) and disease-specific indicators (17 out of 26) are only recommended and not used in practice. Whether these indicators are effective when used in practice is uncertain.

The way the indicators are used in practice sometimes differs from their intended use (1, 39, 43, 44). The acceptance of indicators into medical practice can be a challenging process. The probability of indicators being accepted increases if there is evidence for the connection between the indicator and medical outcomes. However, the evidence for many indicators is lacking. Furthermore, ambulance nurses and drivers do not see the patients after transporting them, and therefore, it is difficult to see the impact of the administered care (3, 13). This can result in professionals not using or only partly using the quality indicators (45).

Poorly implemented indicators sometimes cause unintended or perverse effects. For example, in the English ambulance services staff started measuring their response time later and stopped the measurement earlier in order to record shorter times (1, 44). This

manipulation of quality indicators is a form of policy-practice decoupling. It occurs when indicators are implemented poorly and workarounds are created (1, 39, 43).

An indicator often measures one aspect of care and, based on that aspect, the quality of ambulance service can be judged (1, 44). In some cases, people focus only on the aspects of care that are measured by the indicators. Then means-ends decoupling can occur: the indicators themselves become the perceived goals. The unmeasured or immeasurable aspects of performance are then neglected (1, 39, 43, 44). It is thus important realise there are two sides to quality indicators: how indicators are officially designed, the policy side, and the way they are used and changed in practice, the practice side.

Lastly, it is important to note that literature about the Dutch ambulance service context is sparse. A single article focuses on a small part of the quality of Dutch ambulance service (21). Since ambulance service systems differ per country (10), indicators that are effective in other countries may not accurately measure quality in the Dutch context.

Quality indicators for ambulance service should measure the key concepts of quality. However not all indicators are able to do so (44). Some of the indicators described in the literature do not measure the key concepts of Dutch ambulance service. They have weak or negative evidence and may also give false results. Some of the indicators that measure key concepts may be missing in the Dutch ambulance service context. They are only used in other countries or not mentioned in international literature. Therefore, the voices of Dutch ambulance nurses, drivers, managers and policy advisors are essential for the critical development of a suitable set of quality indicators for the Dutch ambulance service context that are evidence based, applicable in practice and measure the essence and the key concepts of quality.

3. RESEARCH METHODS

The aim of this research is to gain insight into which quality indicators are suitable for measuring ambulance service quality. Little is known about quality indicators for Dutch ambulance service, and therefore this research can be considered exploratory.

I collected the thoughts and opinions of people working in ambulance service, regarding the quality and quality indicators for this service. This research encompasses both the policy and practice side of quality indicators for ambulance service. Since the indicators need to be applicable to the Dutch ambulance service practice, this research also explores its context and systems. Qualitative research methods are applied in this research as these are an appropriate way to get insight into experiences, thoughts and opinions (46).

3.1 DATA GATHERING

This research uses four different methods for data collection: literature review, document analysis, semi-structured interviews and observation.

LITERATURE REVIEW

To get an overview of the quality indicators for ambulance service internationally described a small literature review was performed, providing a broad search strategy (47). This technique is generally used to summarise research findings and identify research gaps (47).

Studies I selected had to (a) focus primarily on the ambulance service context and on quality indicators in ambulance service, (b) be written in English or Dutch, and (c) have a publication date from 2000 onwards. Literature was collected using the Google Scholar search engine. The search terms I used are: ‘indicators ambulance care’ and ‘indicators pre-hospital care’. I determined whether the articles identified through the search met the inclusion criteria based on their title, abstract, and key words. This resulted in 21 selected articles. These 21 articles were read completely. Based on the complete articles I used 17 for the review. The other four articles were rejected because they didn’t meet the inclusion criteria (Figure 1).

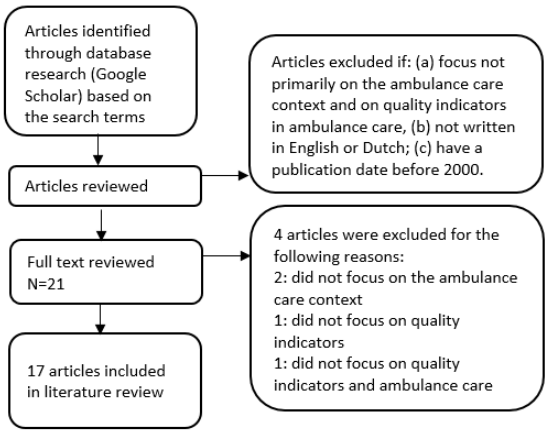

Figure 1: Flowchart showing the results of the search strategy

DOCUMENT ANALYSIS

To understand the Dutch ambulance service context, I also analysed documents, specifically policy documents, protocols and guidelines used in ambulance service. These offered insight into what indicators are currently used in Dutch ambulance service and how quality is ensured. I gathered these documents in various ways. Some documents were sent to me by policy advisors of a Dutch ambulance organisation. Other documents were found on the websites https://www.ambulanceblog.nl/ and https://www.ambulancezorg.nl/. Lastly, I located the documents that respondents mentioned in the interviews. An overview of the documents analysed can be found in Appendix 4.

SEMI-STRUCTURED INTERVIEWS

I conducted 15 semi-structured interviews with 16 ambulance nurses, drivers, managers and policy advisors. The respondents were asked for their thoughts and opinions about ambulance service quality and its measurement. The interviews were structured with a topic list, found in Appendix 1 (48).

The sampling of respondents for this study was done with criteria-focused sampling (49). Respondents were asked to participate based on their profession. I contacted some respondents directly by email. Others were contacted through a researcher at the ambulance organisation they were working in. After those respondents expressed their consent to be interviewed, they were placed in contact with me. I emailed them to make an appointment for the interview. Nurses and drivers were asked to participate if they were working during the observation days, directly after which I interviewed them. So there was a combination of criteria-focused and opportunistic sampling (49).

The 15 interviews were conducted with two policy advisors, five managers, five ambulance nurses and four ambulance drivers (Appendix 2). The interviews with the managers and policy advisors were focused on the policy side of quality indicators for ambulance service. In the interviews with nurses and drivers I focused on the practice side. The goal of the interviews was to gain insight into the thoughts and opinions of ambulance service employees: their view of quality, suitable quality indicators and the potential advantages and disadvantages of applying these indicators in ambulance service.

The managers and policy advisors interviewed work at different levels in ambulance service. One policy advisor works for the AZN. The other policy advisor and the managers work in an ambulance organisation in the Netherlands. Three of the managers are operational managers, on a regional level. The policy advisor works on a national level. The educational manager and medical manager work on a national level. The ambulance nurses and drivers work in one ambulance region. I interviewed 13 men and three women. The Ministry of Health refused to participate. They stated that indicators for ambulance service are governed by the field and they do not participate in the process. One person in the AZN participated, since she was the only expert in this area. The insurance companies I contacted did not respond to my invitation to participate in the research.

The longest interview took 1 hour and 21 minutes and the shortest interview 13.5 minutes. On average, the interviews took 51 minutes each. Since only one interview with a nurse and one interview with a driver was recorded, the durations of the other interviews are unknown and are not considered in this average. I conducted interviews from the 19th April until the 10th May, 2017. Nine of the interviews were recorded with a smart phone and an iPod or with two smart phones, with the permission of the respondents. In addition, I made notes before, after and during the interviews. During the unrecorded interviews I made extensive notes, with the permission of the respondents. The interviews with policy advisors and managers took place in the office of the respondents six times and in a room in Erasmus University once. The interviews with nurses and drivers took place in their canteens and outside, during their breaks. Seven interviews were combined with another researcher for her master thesis. Four of the interviews were held in English, three partly in English and partly in Dutch and eight in Dutch. During nine of the interviews, other people were in the room. One interview was interrupted with a phone call.

OBSERVATION

Lastly, I performed two days of observation at an ambulance distribution centre. The observations helped me to understand the current ambulance service context and how quality indicators fit into it. It also gives context to what respondents said in interviews.

The observations were conducted on the 3rd and 9th May, 2017. I did not participate, but made notes during the observations. In addition, I conducted several informal interviews with ambulance nurses, ambulance drivers and managers. These had the aim of learning more about the work that ambulance nurses and drivers do in an informal way. In addition, I used this as an opportunity to introduce myself to the respondents and to establish a safe environment. For privacy and security reasons, travelling in the ambulances was not possible.

3.2 ANALYSES

After conducting the semi-structured interviews, we transcribed the interviews. I analysed these transcripts. This data analysis was inductive (49). The codes are chosen based on the patterns found in the interviews. In the first round of coding (open coding), I used 24 codes (50). The codes were structured based on the sub-questions. I did this during my analysis, and therefore I made two versions of the first round of coding. The codes can be found in Appendix 3. Afterwards, axial coding was applied for the results. The codes were added to the interview transcripts as comments and documented in Microsoft Office Excel.

For example, the importance of equipment for the quality of ambulance service was mentioned in nine interviews. Every time someone spoke about equipment, a code was given, and I did this a total of 13 times. This showed that the respondents felt that equipment is an important facet of ambulance service quality. Therefore, I concluded that it is one of its defining facets.

3.3 ETHICAL CONSIDERATIONS

During this research, I took several ethical considerations into account. First, the privacy of the respondents and their patients; to not harm the respondents and the organisations they work for, I anonymised their personal information (50).

Nine respondents gave their permission for the interviews to be recorded. All respondents were asked if they wanted to receive the transcripts of their interview. Seven requested this and I honoured these requests. The final rapport will be send to all the respondents. The audio recordings will be erased at the conclusion of this research.

During the interviews, the personal and medical information of specific patients was not requested or discussed. During the observation, there was no direct contact with patients. I did not hear or see patients' names, medical information and other personal information during the observation.

3.4 VALIDITY AND RELIABILITY

To guarantee the quality of this research, it is important to take the validity and reliability into account. Reliability and validity are combined with quality criteria for qualitative research (46, 49, 50).

Internal reliability is minimal disruptive interference of the researcher as a research instrument. This is linked to credibility, if the results can be confirmed by others (49, 50). I ensured internal reliability by using a pre-prepared topic lists during all of the interviews and by sharing the raw material, such as transcripts, notes and documents from the researcher, with my supervisor.

External reliability is about the replicability of the research. Since qualitative research is time and context dependent, it is not possible to replicate it exactly. Therefore, it is important to document the process of the research and the role of the researcher (46, 50). This is also important for the qualitative criteria dependability (49). I documented the research process in a logbook (Appendix 5). In addition, I recorded my expectations of the results before the data collection (Appendix 7) and reflect on these expectations in the discussion.

External validity concerns the generalisability of the research and relates to transferability. Generalizing is not the goal of qualitative research. However, quality indicators in ambulance service are an under-researched topic and my research can fill a part of this gap in the research. Therefore the conclusions may be applicable to other comparable contexts (46, 49, 50).

Internal validity concerns measuring what you want to measure with the measurement tool. Because the researcher is the measurement tool, internal validity concerns the credibility of the researcher's interpretations. This also relates to confirmability. The results should be the result of the research and not the product of the researcher (46, 49, 50). In addition to the

logbook and self-reflection, I ensured internal validity by doing in-depth data collection. The interviews took approximately 50 minutes on average and I used follow-up questions. Furthermore, this research uses different forms of triangulations, such as data triangulation and research triangulation.

4. RESULTS

In this chapter, I present the results of this research. First, I describe the current methods used to measure ambulance service quality. Then, I give an overview of the most important facets of ambulance service quality according to the respondents. Next, I describe what the respondents would like to measure. Lastly, I present the positive and negative effects of quality indicators according to the respondents.

4.1 SITUATION NOW

This section describes how quality is currently ensured, measured and tested. First, I describe the relevant laws and regulations, then the function of the Dutch Health Care Inspectorate and AZN. I conclude with a description of the currently used indicators and implemented indicators.

LAWS AND REGULATIONS

Ambulance service quality is ensured and measured through laws and regulations. The Temporary Ambulance Care Act (Twaz) states that one ambulance provision per ambulance region is responsible for performing ambulance service and maintaining the dispatch centre. In addition, the Twaz also describes the response time criteria for emergency ambulance service. The Twaz will expire on the 1st January, 2020.

Ambulance organisations should also act according the general healthcare acts,[1] which describe the criteria that ambulance organisations should comply with, to act as good healthcare organisations. In addition to the medical laws, they should also act according to traffic laws.[2]

Ambulance nurses should act according to the Medical Treatment Agreement Act (WGBO) and the Individual Healthcare Professions Act (BIG). These acts describe how healthcare professionals should act, what criteria they should meet and the treatment agreements professionals have with their patients. In addition, nurses should be signed up to the BIG register. Organisations and nurses can be inspected on whether they meet the necessary criteria. If they fail to do so, they can be brought to court or fined.

[1] Quality, Complaints, Disputes Healthcare Act (Wkkgz), Client participation Health Institutions Act (WMCZ); Care Institutions Eligibility Act (WTZi), Medical Devices Act (Wmh), Compulsory Admission to Psychiatric Hospitals Act (BOPZ), Personal Data Protection Act (WBP) and Safety Regions Act (Wvr).
[2] Road Traffic Act (WvW) and Road Traffic and Traffic Signals Regulations Act (RVV).

'…there are a lot of lawyers nowadays. And sometimes even after five years they write some letters and they are looking for proof or they want to check if I did some failures with my care.' -emergency nurse 2-

THE HEALTH CARE INSPECTORATE

The Dutch Health Care Inspectorate (IGZ) is the supervisory authority for ambulance service. They ensure that ambulance providers deliver good quality care. The IGZ judges if nurses, drivers and organisations act professionally and within the scope of laws and regulations, respect the protocols and standards and continuously strive for the improvement of care.

Incidents should be reported to the IGZ, who also conduct audits of the ambulance organisations. They can offer suggestions for improvement or put sanctions in place if the organisation performs badly.

'About every year we have had an external audit. So, with external auditors. That are your examination moments, so to say. Well to look if indeed: is it in order? Is it going like they expect from us? Or are there indeed points for improvement?' -operational manager 2-

UMBRELLA ORGANISATION (AZN)

The umbrella organisation AZN has different tasks that focus on quality insurance, such as lobbying and external and internal agreements. One important example is the development and implementation of protocols and standards. The AZN has developed a Responsible Ambulance Care Memorandum. In this memorandum, responsible ambulance service is described as available and accessible; transparent; professional, high quality and safe; clearly and unequivocally reported, with guaranteed patient privacy; fitting in perfectly with care chain partners; providing adequate, approachable complaint handling; providing participation for patients; and being provided by organisations that meet the criteria for good governance. This memorandum is seen by some respondents as the definition of Dutch ambulance service quality.

'…we have the so-called memorandum responsible ambulance care it is, I don't know if you heard of it. It defines quality and what you need to do for delivering the right care. So maybe there is not one definition, but it is described.' -policy advisor 1-

Another important document that is co-developed by the AZN is the National Protocol for Ambulance Care (LPA) (current version 8.1 June 2016). The LPA describes what medical procedures nurses should perform for common conditions and gives instructions for preparing for and completing care and a description of the properties of the medication stocked in the ambulance. This protocol is an evidence-based medical standard for Dutch ambulance nurses.

In addition, the AZN set national guidelines on specific themes, such as hygiene (Appendix 4). These guidelines help ambulance organisations and employees to focus on these themes. Organisations also compose their own protocols and work instructions, in which they specify the broader protocols of the AZN.

> *'…the national protocol ambulance care is LPA. That is really national protocol, not specifically for organisation x, but for whole Netherlands. Then we have national procedures, for like the, like disasters and procedures for the continuing your regular care. That is also, the formats for there are also made on national level by AZN. And then we have a lot of procedures on organisation x level, national organisation x level.' -policy advisor 1-*

The AZN ensures and assesses ambulance service quality by educating ambulance nurses and drivers. Firstly, there are admission requirements for nurses and drivers. Emergency nurses should be specialized in emergency room, intensive or cardiology care. Planned care nurses should be qualified as Carer Individual Healthcare Level 3 (VIG3). The drivers should have a driver's licence and a first-aid diploma.

After meeting these admission requirements, nurses and drivers must undertake specialised training to become a nurse or driver on an ambulance. With this education, nurses should, for example, be able to plan and execute care. Drivers should be able to execute the primary traffic and care process efficiently and effectively. Both nurses and drivers should be able to communicate and cooperate. Drivers have minimum of 875 practical and 240 theoretical teaching hours and nurses 925 practical and 184 theoretical teaching hours.

> *'That are all specialized nurses that ride along as a third nurse on the ambulance for eight months and during this riding along they follow an education. It contains examinations, theory and sort of a final assessment. If they have passed all this and they have done a certain number of practical hours, 950 practical hours. Then they graduate.' -manager 1-*

The education is not complete after graduation, however. Drivers and nurses need to gain 184 points over five years in continuing education for their accreditation. They must perform assessments to verify that their knowledge and skills are up to date.

> *'They need to join in the accreditation track, obtain 184 points per five years. Thus about 30, 40 per year. And every training day, there are obligated courses, but also elective courses, that you need to choose. That is worth a certain amount of points.' -manager 1-*

In addition, patients can report complaints and compliments to the regional ambulance service. The number of complaints and compliments are recorded. This is done nationally, but also regionally and within each organisation.

> *'There are not many complaints, three in 25 years. And only one was justified.' -planned driver 3-*

CURRENTLY USED INDICATORS

Two indicators are currently used in Dutch ambulance service: response time and patient satisfaction. Patient satisfaction is incidentally measured in Dutch ambulance service. This is done by The Dutch Institute for Healthcare research (Nivel) with a Consumer Quality Index (CQI) questionnaire.[3]

> *'We measure the results, so well the clients, the client satisfaction. We recently finished a measurement, a national measurement with CQI.' -policy advisor 2-*

In 2013 and 2017, Nivel published a report about patient satisfaction using the CQI questionnaires. In both years patient satisfaction with ambulance service was around nine out of 10, with little variation between regions.

> *'Recently Nivel made a survey about quality. What you see there is that the patients are very satisfied' -manager 2-*

Insurance companies, the IGZ, AZN and ambulance organisations currently use response time to measure the quality of Dutch ambulance service. The response time is used to determine how many ambulance posts and how many ambulances per post are required. Response time is also used in negotiations between insurers and ambulance service providers about the financing and performance of ambulance service providers. Lastly, it is used to check whether ambulance organisations work quickly enough. If organisations do not meet these criteria they are charged a fee.

> *'… we have to be there in 15 minutes or 30 minutes. Depending if it is an A1 or A2. That is a planning thing, a planning issue, not a quality issue. It was introduced as a planning issue.' -manager 2-*

Response time consists of the sum of three of times phases. The 'reporting time' is the time from a controller picking up the phone to the ambulance team being contacted. The 'turn-out time' begins when the ambulance team is contacted by the controller and ends when the ambulance departs to the provided address. The 'drive time' is the time from the moment the ambulance leaves to the moment the ambulance arrives at the patient's location.

The level A1 life-threatening emergencies must have a response time of 15 minutes or less in 95% of cases. The non-life-threatening cases require a response time of 30 minutes in 95% of the cases. These requirements are legally binding, as they are prescribed in the Twaz.

[3] There is a CQI questionnaire for planned and for emergency care. Planned care patients can judge based on six criteria: transport, approach, actions, communication, knowledge of transportation time and picked up during the agreed time. Emergency care patients judge based on seven criteria: dispatch centre, transport, approach, actions, communication, emergency room and response time.

'… those 15 minutes come from a national distribution plan, what is based on that every civilian, or 95% of the civilians should be able to reach in 15 minutes.' -policy advisor 2-

INDICATORS IN DEVELOPMENT

In recent years, the AZN has developed quality indicators with a project group they organised. These indicators are:

1. Percentage of trauma patients for whom a pain score is measured.
2. Percentage of trauma patients with a high pain score who received pain medication.
3. Percentage of planned care patients who were brought to the destination on time.
4. Percentage of patients who were left on the scene and needed ambulance service again.
5. Throughput time for stroke patients.
6. Time between calling dispatch centre and arrival at hospital with STEMI.
7. Percentage of patients with cardiac arrest who were missed.

These seven indicators are based on aspects that the project group found relevant for ambulance service quality. They are composed on the basis that these are the areas where ambulance service can influence quality and what aspects ambulance service can measure.

'… we said, that we needed to develop indicators that can be our responsibility and that we can measure ourselves. And another important principle was that we needed to develop indicators on aspects of ambulance service where we, that matter.' -policy advisor 2-

The AZN is currently testing and implementing those indicators in field tests. These field test are being performed nationally to identify the problems the indicators can cause and to find solutions to them before using these indicators to measure ambulance service quality becomes the Dutch standard.

'Currently we have in our management system, we have implemented the quality indicators. And those are collected by Ambulancezorg Nederland.' -operational manager 1-

These indicators are intended to be additional to the indicator of response time.

'… it is actually very much based on time. That is also the reason why we added some new elements, also nationally. That we say we want more. We do not want to be judged based on time, but also make some substantial aspects transparent and we do that by developing other quality indicators.' -policy advisor 2-

In this research, I will reflect on these nine currently used and implemented indicators: response time, patient satisfaction and the seven indicators in development listed above.

4.2 WHAT IS QUALITY?

Nurses, drivers, managers and policy advisors working in ambulance service have a professional opinion about what good ambulance service quality is. What is remarkable is that the facets that they find important do not overlap with what is currently measured in the Dutch ambulance service context. Analysing the transcripts of their interviews, the following eight codes occurred in the open coding phase: being patient centred, patient satisfaction, behaviour towards patients, educated staff, doing your job, driving behaviour, equipment and transport. In the axial coding phase, I grouped these into 5 facets: being 'patient centred', 'patient experience', 'skilled staff', 'equipment' and 'transport'. These facets will be discussed further in the following section.

PATIENT CENTRED

Respondents find it important for ambulance service to be delivered in a patient-centred way, tailoring care to the patients' needs. Ambulance service delivers a wide spectrum of care, including planned and emergency care. Even within these categories, there is a wide spectrum of patients who all have individual needs and wishes. In planned care, some people want to talk and others just want to travel in the ambulance in silence.

> *'There are also patients that like it in the care. Or patients we have more times per week. And they. You see them more than one in a week. So, you talk to them and talk about their family. […] but sometimes they don't want to say anything.' -planned driver 1-*

In emergency care, you also have a wide scope for patients with different needs. There are patients who just need to be brought to the hospital as quickly as possible, but also psychiatric patients who need help and patients who can be treated on location. These different needs should all be considered.

> *'So, you have to act on the scene. But it doesn't have to stay and play for long. But just enough to get him, to get the patient stabilised. And then get him to the hospital. That is what I think. And that is for the acute ambulance care. We need to keep in mind that we also have Mister Jansen who is short breathed, you know the old grandfather and we have the psychiatry.' -manager 2-*

PATIENT EXPERIENCE

Another important facet of ambulance service quality for respondents is 'patient experience'. The goal for them is to deliver the best possible care for the patient. They find it important that their patients are happy with the care they got and feel well treated and taken seriously.

'You can deliver substantially very good care. But if the patient feels that he has been treated unfairly, then, then things are not going well either.' -policy advisor 2-

Excellent patient experience can mean different things. It can be ensuring that the patients have as little pain as possible, but also arranging the care in a less stressful manner to improve the patient experience. Giving emotional support to a patient in a difficult situation is in their experience sometimes more helpful then giving the right medication.

'And sometimes you don't have to give medication, you just start talking, sit on the couch and say what is wrong with you. I personally think this is the best medication.' -emergency nurse 2-

SKILLED STAFF

'Skilled staff' is also a facet of ambulance service quality, according to the respondents. The respondents highly value the knowledge and skills of ambulance nurses and drivers.

'Quality is expertise and professionalism. When you keep up with the current procedures. Keep yourself educated.' -emergency driver 1-

For nurses, this means medical knowledge and skills, which they acquire from their education and training, but also from experience. The medical part of ambulance service is crucial according to the respondents, particularly performing appropriate medical interventions and improving the medical situation for the patient.

'My perspective would be best medical care, but also the best care from the perspective of the patient.' -manager 2-

Working according to protocols is often seen as the equivalent of delivering good medical care. This means that ambulance nurses need to know which protocol they must follow and follow the protocol correctly in order to give the correct medical care.

'… to get right medical help to the patient and take as quick as possible to the hospital. In line with their protocol LPA.' -operational manager 3-

However, following the protocol is not enough for everyone; professionals also find it important to combine the protocol prescriptions with their professional knowledge, which gives them more flexibility.

'Couple of years ago we had the protocol and you put it in front, and a called it a cookbook medicine. Now you put it next to you. So, you use your knowledge and you use the protocols and you combine them.' -emergency nurse 2-

The skills that respondents value in ambulance drivers relate to their driving behaviour, that is, driving safely and providing comfort for the patient. These skills are acquired during their ambulance driving education and in the training afterwards.

'For me as a driver. To drive carefully. And the bumps in the road go around them or go really slowly over them.' -planned driver 1-

EQUIPMENT

'Equipment' is another facet, that should be of good quality, according to the respondents. The nurses and drivers should keep their cars clean. In addition, it is important that they check whether the machines in the ambulances are working and the batteries are charged.

'… so that is taking care of your vehicle, well taking good care that the invent, inventory is in order, that the equipment in your vehicle also work, that you ascertain yourself of that.' -operational manager 2-

A recent change in ambulance service is the electronic stretcher. The respondents praise this new piece of equipment, since in their experience it improves their working conditions.

'Quality is ensured by equipment. The equipment should be up to date. Also new developments that make the work easier, for example the new electronic stretcher.' -emergency nurse 1-

TRANSPORTATION

The last facet that the respondents find important is 'transportation', as it is important to get to the hospital as fast as possible, especially for emergency patients.

'But there is more and more evidence that is better to pick up a patient and bring him to the hospital as quick as possible. Because in the hospital is the most safe environment for the patient.' -manager 2-

Patients use planned ambulance service when they want to be transported, that is, to be brought to their appointment in the hospital or transported from the hospital to a nursing home. Transportation is crucial to arrive on the requested destination for planned care.

'That is that people arrive safe from A to B.' -planned driver 2-

FIVE FACETS

The respondents define 5 facets that together define ambulance service quality: being 'patient-centred', 'patient experience', 'skilled staff', 'equipment' and 'transportation' (Figure 1).

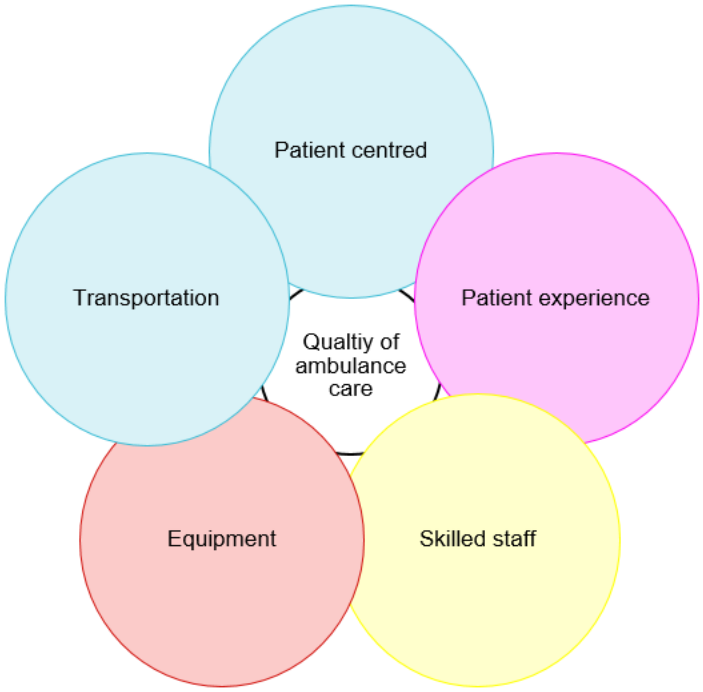

Figure 1: Facets of ambulance service quality experienced by professionals
Colour-codes aspects from international literature: yellow: 'staff', red: 'material facilities', turquoise: 'care provision', pink: 'patient outcomes'

When you compare the facets experienced by professionals to the aspects described in the literature ('organisation staff', 'material facilities', 'care provision', 'documents & protocols', 'adverse events' and 'patient outcomes'), some remarks can be made.

It is apparent that there is a distinction between practice and theory. There is a difference between the ambulance service quality experienced by professionals and that described in the literature. Of course, the facets 'transportation' and being 'patient centred' both fit with the aspect 'care provision', 'patient experience' is related to 'patient outcomes', the facet 'skilled staff' belongs with the aspect 'staff' and 'equipment' is related to 'material facilities'. However, there are no facets relating to the aspects 'organisation', 'adverse events' or 'documents & protocols'.

There is also a gap between policy and practice. The nine currently used and implemented indicators do not correspond with the ambulance service quality experienced by professionals. Little overlap appears between the five facets and the currently used and implemented indicators: the facets 'skilled staff' and 'equipment' have no matching indicators; the indicators related to the aspect 'care provision' are all focussed on time; and these time related indicators can be matched with the facet 'transportation'. However, none of the indicators match the other 'care provision' facet 'patient centred'. The facet 'patient experience' is the second facet with a matching indicator: patient satisfaction. The aspects

‘protocols & documents’ and ‘adverse events’ both have two corresponding indicators. However, the respondents do not mention these quality aspects as one of the facets of ambulance service quality.

4.3 WHAT THEY WANT TO MEASURE

In this section, I describe how the respondents think ambulance service quality should be measured.

PATIENT SATISFACTION

Respondents want to judge quality of care based on ‘patient experience’.

> *‘In a perfect world, I would measure the end result, what the patients experienced after I gave care. It's my most important marker.’ -emergency nurse 2-*

The respondents want to use the indicator patient satisfaction to measure ‘patient experience’. A good and unbiased view of how every patient experienced their care can be measured with patient satisfaction questionnaires, according to a respondent.

> *‘I think the patient’s view is very important. That is what relates to the care we give to the patient. If you can ask every patient how was the care, can you give an example and feedback? In ideal situation that would say something about the quality that is given to the patient.’ -operational manager 3-*

PRIOR EDUCATION, ACCREDITATION AND ASSESSMENT

The respondents find it important that nurses and drivers that work on the ambulance are well educated. Prior education, accreditation and assessments are ways in which the skills and knowledge of the ambulance drivers and nurses can be measured.

> *‘Medical quality is assured by training, by skills, education, education plans, year plans, every ambulance driver or nurse has to have several trainings per year. ’ -operational manager 3-*

The respondents are worried about a new group who have recently been allowed to work on the A1 ambulances. They are not qualified nurses and often do not have the practical experience in the hospitals that nurses working in ambulance service do. Therefore, some people are worried that they are not educated well enough to work on an ambulance.

> *‘And nowadays they have a bachelor emergency care. They are specially trained in an emergency care. Not widely trained but very narrow trained, maybe in cardiac arrest, but not psychiatric problems. […] I think the bachelors can work on the ambulance, I'm going to train them here. But not now, after couple of years working experience in clinic.’ -emergency nurse 2-*

Also training while working is seen as an important indicator. The 184 accreditation points and annual assessments can be a way to measure whether someone's knowledge and skills are up to date.

> *'As a branch, we agreed that the ambulance staff needs to do an assessment once a year. We have a regional training policy. But also, according to national guidelines that every ambulance employee needs to get the 184 accreditation points in that time.' -operational manager 1-*

AMOUNT OF RESTRICTED PROCEDURES PERFORMED

Another way the respondents want to measure the skills of nurses is by monitoring the amount of times per year a nurse performs a restricted procedure and checking whether nurses reach the agreed target.[4] The underlying idea is that when you apply your skills regularly in practice, you can meet the required standards, as more experience leads to better skilled professionals.

> *'… a new digital medical file, in which you can also properly measure the amount of procedures per nurse, per nurse. Because if you intubate only once, it is not very much. So, you should show that in again in your education.' -operational manager 1-*

This is related to the number of trips or ambulance hours a nurse or driver needs to accumulate to keep their skills up to date. The respondents would like to know how many active ambulance hours or trips are required for this. This is because they think there is a relationship between the number of hours someone works or the number of trips they make and how much someone practises their skills.

> *'What are the minimum number of hours that an employee for example needs to be employed to keep their skills up to date?' -operational manager 2-*

DRIVER STYLE

The respondents would like to measure driving style, since this determines whether the transportation of the patient is as quick and comfortable as possible.

> *'You drive as comfortable as possible. The shortest way is not always the quickest. You also drive in another way with pain than with real emergency.' -emergency driver 1-*

Drive style can be measured by looking at the ambulance black boxes which register the ambulance's journey.

> *'We have a black box on every ambulance, we use for complaints and incidents. But we don't use it structurally for analysis. And I think looking at patient satisfactory analysis the driving behaviour is one of the thing in which we can make a difference.*

[4] Currently no number has been agreed on by professionals.

Because making turns while the patient is in the back, is very, can be very painful, or make them sick. So, if we start to have more information about that we can make a, we can also deliver quality in a better way.' -policy advisor 1-

SOCIAL SKILLS OF NURSES AND DRIVERS

Social skills of nurses and drivers is also something that the respondents would like to measure. This because they find social skills important to adapt property to a situation and the patients' needs.

'… I think if you want to delivery real quality you also have to behave properly when there is an urgent situation, or a non-urgent situation where you have a social talk with your patient and not for example watch your smartphone because you are riding from A to C and it is taking a while.' -policy advisor 1-

Ambulance nurses and drivers experience that this is not learned from education or training, but is something you do due to the kind of person you are and your experience.

'The social skills are in how you are as a person and you learn it during the work. […] life experience also counts very much in how you look, think and do. You learn a lot through the years about people.' -planned nurse 1-

NON-EMERGENCY CALLS

One of the things that worries the respondents is the amount of calls that are made for ambulance service that do not require emergency ambulance service. Ambulance nurses feel that they often drive to patients who do not need their help and they fear that other patients suffer as a result.

'I personally think this is not the best situation. We do not have enough ambulance on the street but when every time you send an ambulance to something stupid, there is somebody waiting with a severe chest pain.' -emergency nurse 2-

Therefore, they would like to measure the rate of non-emergency calls to understand the extent of this problem and whether any changes to the system are needed.

CHAIN OF CARE

Collaboration with chain partners is an important feature for the respondents to measure. However, this is not currently performed. There are currently no indicators that measure the whole chain of which ambulance service is a part. The respondents therefore think that it is important to have indicators that measure the quality of the entire chain of care.

'I think the only way to get a real grip on if we gave good quality of care, is to see it broader and take the chain of care.' -manager 2-

The respondents also fear that information is lost during the transfer of the patient to chain partners. They would like to measure and improve this.

> *'There is a lot of data missing because I will type my report but nobody will look at it in the hospital. For example, in psychiatric patients, what's the condition, what do I see, what is the social situation, is it a total mess? You will see alcohol bottles everywhere. I write it in my report, but the hospital will not have a look most of the time.'*
> *-emergency nurse 2-*

TWO GAPS

On a quality indicator level, there also is a gap between policy and practice. Looking at the two currently used quality indicators, only patient satisfaction is a desired indicator mentioned by the professionals. Response time is not mentioned as something the respondents want to measure (Table 5).

What the respondents would like to measure can be linked to the quality aspects from the literature (Table 5). Patient satisfaction is linked to 'patient outcomes'. Prior education, accreditation, assessment, amount of restricted procedures, time working on the ambulance, driver style and social skills of nurses and drivers all belong to the aspect 'staff'. Non-emergency calls and chain of care are related to 'organisation'.

Focussing on the currently implemented quality indicators there is a striking difference. The seven quality indicators the AZN is implementing are focussed on the aspects 'care provision', 'documents & protocols' and 'adverse events'. However, the indicators that the respondents want, are focused on the three other aspects (Table 5).

The lack of overlap can be partially explained. The provision of care is implicit for nurses and drivers. It is part of doing their job, and for them it may not be measurable. Therefore, the respondents see 'protocols & documents' as a part of 'skilled staff', so it is logical that they did not mention separate indicators for this aspect. Since the AZN ensures education, the AZN may not find staff-related indicators necessary. However, the respondents find skilled staff one of the most important facets of ambulance service quality and thus mentioned the most indicators for that.

There is also another remarkable gap. On a practical level, there is a gap between the definition of and indicators for ambulance service quality. The respondents mention indicators for only two of their five facets of quality: 'patient experience' and 'skilled staff'. Strangely, the other indicators they mention are not linked to the five facets. The respondents do not know how being 'patient centred', 'equipment' and 'transportation' can be measured. Therefore, the respondents mentioned things that they think are measurable: non-emergency calls and chain of care. However, these are not linked to what the respondents define as

ambulance service quality. There is thus a difference between what people define as ambulance service quality and what they mention as indicators for it.

Table 5: Available, current and desired quality indicators

Literature **Aspects of quality of ambulance service**	Policy **Quality Indicators** (Situation now + AZN indicators 9 indicators)	Professsionals **Facets of quality of ambulance service**	Professionals **Desired Quality Indicators**
Organisation			-Non-emergency calls -Chain of care
Staff		-Skilled staff	-Prior education -Accreditation -Assessment -Amount of restricted procedures -Workingtime on the ambulance -Driver style -Social skills of nurses & drivers
Material facilities		-Equipment	
Care provision	-Response time -Time between calling dispatch centre and arrival hospital with STEMI -Percentage of planned care were brought to the destination on time -Throughput time stroke patient	-Patient centred -Transportation	
Documents & protocols	-Percentage of trauma patients where pain score is measured -Percentage of trauma patients with a high pain score that got pain medication		
Adverse events	-Percentage missed patients with cardiac arrest -Percentage of patients that were left on the scene and needed ambulance care again		
Patient outcomes	-Patient satisfaction	-Patient experience	-Patient satisfaction

dark blue: organisation, yellow: staff, red: material facilities, turquoise: care provision, green: documents & protocols, orange: adverse events, pink: patient outcomes

4.4 EFFECTS OF INDICATORS

The use of quality indicators can have various effects on the way ambulance service is delivered. The respondent experience certain effects of the currently used and implemented indicators and expect some effects of the potential future indicators. This section describes the positive and negative effects of indicators for ambulance service quality.

NEGATIVE EFFECTS

The respondents experience three disadvantages of the currently used and developed: administrative burden, decoupling and distrust.

Administrative burden

A negative effect that the respondents experience is the administrative burden. Ambulance nurses need to fill in a digital medical file after they treated a patient, which takes 10 to 30

minutes to fill in. The information required is increased each year. Most nurses do not like to fill in these forms.

> *'The longer we make the form they have to fill in, the more frustrated they get. And they want to give patient care and not administration.' -policy advisor 1-*

To get the information for the AZN indicators, the obligatory parts of the forms need to increase, but the respondents fear that if the obligatory fields increase the administrative burden will become too much for the nurses.

> *'But still, you know if you push too much and well you let them register too much and they experience it as a burden, then of course it can lead to people doing it less and less'. -operational manager 2-*

Distrust

Another problem that the respondents experience is untrustworthy indicators. The respondents see that the information that is used for the currently implemented AZN indicators is not filled in in the same way in every ambulance region, in every post or by every nurse.

> *'But the new national indicators which AZN made […] the information we have right now is based on what is what is filled in in the digital medical file of every patient. And as long as that is not used exactly the same by all people, we can't really trust that information.' -policy advisor 1-*

These variations in reporting can lead to false positives and negatives, making the indicators untrustworthy for the respondents.

False positives and negatives are also a problem in relation to response time. A patient's need for a rapid response varies for each situation. Where 15 minutes is far too long for one urgent call, it is unnecessary for another, which makes response time an untrustworthy indicator for the quality of ambulance service.

> *'… there are of course enough clinical pictures where if it takes 15 minutes nothing happens, then you are lagging behind anyway. And then a patient actually does not have a chance anymore' -operational manager 2-*

In addition, the respondents distrust patient satisfaction questionnaires. This because respondents find that patients cannot judge every aspect of ambulance service.

> *'And if someone comes, is nice to you, picks you up and take to the hospital you don't have an idea if they did the right thigs. They are friendly, bring you to the right place, you are satisfied. Because you cannot evaluate if they did the right things, you are not medically trained.' -manager 2-*

Decoupling

Ambulance organisations change their behaviour to score better on certain quality indicators. For example, the canteen used to be on the first floor of one post. To shorten the turn out time by half a minute, they moved the canteen so that it is right next to the ambulances.

> *'Yes, they have to be as quick as possible by the patient. You can see that we moved the cafeteria from upstairs to downstairs.' -operational manager 3-*

This type of change in order to improve the quality of ambulance service is one of the goals of quality indicators. However, the respondents also see a risk in this. The indicators themselves can become the goal instead of a means of improving quality. This focus on the indicators can result in unmeasured aspects of quality being neglected.

> *'... the biggest risks of using quality indicators is that you are going to work to use these quality indicators and lose the scope where, where you start your job for. You start you job for healthcare.' -manager 2-*

This focus on indicators is visible in response time. For example, the ambulance controller has a limited amount of time to talk to the person calling 112, and they cannot ask thorough questions about the patient's situation. This results in more ambulance trips to situations where an ambulance was not necessary or other care would have been more appropriate.

> *'When I started in the ambulance they had time to ask, talk with the patient. And now in 1.5 minutes they have to put the ambulance on the street and they hardly can talk. They just hear something and say it is 1 call 1 go. And when they are not fast enough they will be fired. I have seen very good dispatchers fired. And sometimes I have to work with terrible dispatchers, but they follow the protocol and they send the can on the streets within 15 seconds or something. I personally think this is not the best situation.' -emergency nurse 2-*

Next to the currently experienced negative effects, the respondents also have some fears regarding potential future indicators. They are afraid that these indicators will do an injustice to ambulance service quality and will be a waste of resources.

Injustice

The respondents also fear that the validity and reliability of indicators will be insufficient. They think that important aspects of ambulance service quality cannot be measured. In addition, respondents fear that these indicators do not take into account that the areas being measured are influenced by several factors that are not measured and are out of their control.

> *'Well I think it a very very hard job for getting quality into hard figures. Because every region, but also every ambulance post have different opinions about how to treat a patient, have regional work instructions. So, for understanding those figures a big risk is that you don't know what is underlaying it. So, it would be great if we could trust*

those figures but we also need an explanation about why the figures are the way they are.' -policy advisor 1-

Waste of resources

Lastly there is a group of ambulance nurses and drivers that don't see any use in measuring quality. They feel that they know how to do their jobs, that their colleagues also perform well and, therefore, that measuring quality is unnecessary.

'... it is not a problem if you cannot measure it. I know that I do my job well. I have been working for 15 years to figure out how to improve it.' -planned nurse 3-

POSITIVE EFFECTS

The respondents did not mention positive effects of the currently used quality indicators: response time and patient satisfaction. However, they mentioned three things they want to use future quality indicators for: benchmarking, care improvement and practice-based evidence.

Benchmarking

The respondents see benchmarking as an important advantage of measuring quality. Respondents want to compare their performance with those in other regions and other organisations. Currently, ambulance regions are only compared based on response time.

'We keep trying to develop quality indicators, so we can also measure it. That there is a benchmark, what is very hard, between the RAVs, the regional ambulance services' -operational manager 1-

Care improvement

In addition, the respondents want to use the information regarding the indicators to improve patient care. When you can measure the care, it can provide an insight into what is effective and what is not.

'It makes it transparent of course. For yourself and it is more visible where your areas of improvement are. Or anyway it gives you better insight.' -operational manager 2-

With this information, the negative elements can be filtered out, improving the quality of care.

'I would prefer that we find a way that the evil, I just call it the evil, can be filtered out the good' -planned nurse 3-

Practice-based evidence

Another way of using the information is learning what treatments work the most effectively. At the moment, different regions and posts use different treatments for the same illnesses, since they don't know what works best. Using the information from indicators, this could be

established. This would provide evidence of what treatments are best and lead to an increased knowledge of best practices.

> *'Well then you can also say something about the prognosis of the trauma patient. Should we treat them immediately or it is better to drive directly to the hospital? So, I think, that gives scientific insight about how we currently organise ambulance service in the Netherlands.' -operational manager 1-*

5. CONCLUSION

There has been a shift in the focus in ambulance service quality, from transport to care. The quality indicator response time, currently used in the Netherlands, no longer covers the full scope of ambulance service quality. Therefore, this study's research question was: 'What are suitable quality indicators for ambulance service in the Netherlands?' Quality of Dutch ambulance service is defined as *the degree to which ambulance service, both transport and care, for individuals and populations is consistent with current professional knowledge and minimises mortality and morbidity*. A suitable quality indicator has been defied as one that *aligns with the definition of ambulance service quality, has as many advantages as possible, has as few disadvantages as possible and is preferably evidence based.*

The current dominance of response time in quality measurement in Dutch ambulance service is highly questionable. Since this criterion is not evidence based and ambulance practitioners do not find it a suitable measure for ambulance service quality. On the contrary, patient satisfaction is evidence based and favoured by ambulance nurses, drivers, managers and policy advisors. However, this is only measured occasionally. The currently implemented AZN indicators do not correspond to the definitions of ambulance service quality held by the people working in the industry. Consequently, according to ambulance nurses, drivers, managers and policy advisors, the currently used indicators inadequately address the definition of ambulance service quality. Therefore, the currently used and implemented indicators are unsuitable. New indicators, or at least a consensus on criteria based on science, policy and clinical practice is needed.

Analysing, clustering and grouping the quality dimensions and criteria in international literature and Dutch policy has led to a description of seven aspects of ambulance service quality: 'organisation', 'staff', 'material facilities', 'care provision', 'documents & protocols', 'adverse events' and 'patient outcomes'. Based on the assumption that quality indicators should align with the definition of ambulance service quality, in order to address the full scope of ambulance service, at least seven indicators are needed to measure ambulance service quality, one for each of these aspects. Since seeking comprehensiveness for the quality system will result in excessive administration, a lean system is advisable. The generic indicators are taken as the basis for the system and disease-specific indicators can be used additionally, as necessarily. Thus, instead of attempting to measure everything, only essential and appropriate features are measured, just in time.

Quality indicators for ambulance service should measure the key concepts of quality. In the international literature 69 quality indicators for ambulance service, 49 generic indicators and 26 disease-specific indicators are described. Some indicators do not cover the essence of

the corresponding quality aspect. So, the evidence for the relationship between quality indicator scores and good ambulance service is lacking, with evidence being either weak or even negative. Finally, it is important to note that overall there is little literature available about the Dutch ambulance service context.

The most frequently mentioned indicators in the international literature are training and education of ambulance professionals, response time, patient satisfaction, mortality and completeness of clinical documentation. These indicators are also the most frequently used in ambulance service practice and fit with the definition of ambulance service quality, as described in the literature. However, most indicators lack evidence for their practical value.

A comparison between international literature on this topic, an analysis of Dutch policy (laws, rules and regulations), observations and qualitative interviews with Dutch professionals employed in ambulance service revealed striking incongruities.

There is a gap between practice and theory. The respondents mention five facets of ambulance service quality: being ‘patient centred’, ‘patient experience’, ‘skilled staff’, ‘equipment’ and ‘transportation’. These cover four of the seven quality aspects from the literature. Thus, the quality of ambulance service experienced by professionals does not fully correspond the quality of ambulance service described in literature. There is also a gap between policy and practice. The eight of the nine currently used and implemented indicators in the Netherlands measure quality based on quality aspects that do not correspond with what the respondents define as good quality ambulance service. On a quality indicator level, the gap between policy and practice is also visible. The only indicator that is supported by the respondents and currently used in practice is patient satisfaction. In practice, the quality of ambulance service experienced by professionals is not covered by the professionals’ desired indicators of ambulance service quality. In practice, there is thus a gap between definition of and indicators for quality of Dutch ambulance service.

The respondents experience three disadvantages of the currently implemented indicators: administrative burden, decoupling and distrust. The respondents also have some fears for potential future indicators, because they are afraid that these indicators will do an injustice to ambulance service quality and will be a waste of resources. Finally, the respondents did not mention any positive effects of the currently used quality indicators (response time and patient satisfaction). Based on these findings of this research, it is recommendable that new criteria be developed based on literature, policy and the experiences of the professionals.

The only aspect that the science, policy and practice have in common is aspect ‘patient outcomes’, corresponding to patient satisfaction as a quality indicator. Five indicators are

mentioned in the international literature and by ambulance nurses, drivers, managers and policy advisors. These indicators are: rate of non-emergency calls, prior education, accreditation, assessment of ambulance personnel and patient satisfaction. These indicators correspond to three of the seven aspects of quality: ‘organisation’, ‘staff’ and ‘patient’ outcomes. This set forms a promising starting point for the process of defining suitable quality indicators in the Dutch ambulance service context that would measure the key concepts of quality, are evidence based and are practically applicable.

6. DISCUSSION

In this chapter, I compare this research with the literature, I describe the limitations of this research, critically reflect on my influence on this research and give recommendations for future research and policy.

6.1 COMPARISON WITH LITERATURE

Three gaps became apparent in this research: the gap between theory and practice, policy and practice and practice definition and practice indicators. These gaps show that different sources do not agree on what ambulance service quality is and how it should be measured. As a result of this disagreement, researching one source gives a limited view, and consultation of all four sources is necessary to research quality indicators for ambulance service: quality and quality measurements in international literature, measurements cited in policy, what professionals see as quality, and what professionals want to measure. Below, I discuss these three gaps, in which I consider these four sources.

THEORY AND PRACTICE

Three of the seven quality aspects from the literature are not related to the respondents' facets of quality. In addition, the aspect 'care provision' is divided into two quality facets. I discuss explanations for these differences between the quality aspects and the quality facets below.

The lack of facets that overlap with 'organisation' may be caused by a difference in how ambulance service is defined. When looking at ambulance service in a broad sense, how care is organised should be considered. However, when ambulance service is only considered in terms of patient-professional contact, or direct care, 'organisation' may appear less important. This differentiation is visible in the NRV categorisation. The NRV describes the quality of the institution (organisation) and quality of the professional practice (direct care) (30, 32, 33). In the quality facets, the respondents describe the direct care and not the organisation.

Although the aspect 'adverse events' is important in the international literature, it is not mentioned by the respondents. Patient satisfaction is high and complaints are rare in Dutch ambulance service, and ambulance professionals do not see the outcome of their care (13). Due to this lack of experience with 'adverse events', preventing 'adverse events' is not something the respondents associate with good quality.

The difference in ‘documents & protocols’ can be explained if we look at the difference in what ‘staff’ can entail. In the literature staff competence and performance is described as two separate constructs: ability to perform and actual performance (the capability and the doing). However, the respondents see the use of ‘documents & protocols’ (doing) as a part of the facet ‘skilled staff’ (capability). Therefore ‘documents & protocols’ is not mentioned as a separate facet.

The facets being ‘patient centred’ and ‘transportation’ relate to aspect ‘care provision’. This combination of care and transport is also apparent in the indicators related to ‘care provision’, such as transport to the right facility and disease-specific indicators (5, 8, 12). Since ambulance service is a combination of transport and care, both should be considered for ambulance service quality.

The IOM definition

Some remarks can also be made on the comparison of the five facets with the IOM definition. The five quality facets are ‘patient centeredness’, ‘patient experience’, ‘skilled staff’, ‘equipment’ and ‘transport’. The quality definition of IOM is *the degree to which ambulance service, both transport and care, for individuals and populations is consistent with current professional knowledge and minimises mortality and morbidity* (27). Both definitions emphasise the importance of staff knowledge and distinguish care and transport elements. However, minimising mortality and morbidity is implicit in the definition of the respondents, who describe the conditions for minimising mortality and morbidity, equipment and patient centeredness, but do not mention it explicitly.

In contrast with the agreement of science, policy and clinical practice, patient satisfaction is not included in the IOM’s definition. This agreement shows that, patient satisfaction is an important part of ambulance service quality, and should be added to the IOM definition. The definition then becomes: *the degree to which ambulance service, both transport and care, for individuals and populations is consistent with the current professional knowledge, ensures good patient experience and minimises mortality and morbidity*. Patient experience can be considered the respondents’ contribution to this definition.

POLICY AND PRACTICE

The differences between the indicators for ambulance service that are currently used and implemented and indicators the respondents suggest have three explanations.

Most quality indicators used and implemented in the Netherlands focus on time. Response time is the most prevalent indicator and all the currently implemented care provision

indicators are time related. However, according to respondents, time is only a small part of ambulance care and thus is an insufficient indicator. Therefore, it is logical that they did not mention time-related indicators and are sceptical of the currently used and implemented indicators.

Another explanation is the current quality assurance procedure. The respondents mentioned potential indicators for the aspects ‘staff’ and ‘organisation’. The AZN already performs quality assurance procedures relating to the aspect ‘staff’. In addition, protocols relating to ‘organisation’ describing cooperation with chain partners and dispatch criteria are also available. Therefore, the AZN could perceive indicators relating to ‘staff’ and ‘organisation’ as unnecessary and did not develop them.

‘Documents & protocols’ and ‘adverse events’ have corresponding currently implemented indicators, but the respondents did not include these quality aspects as part of their definition of ambulance service. The workgroup of AZN has chosen these indicators based on aspects where they think ambulance service can influence quality and what ambulance service can measure. However, these aspects that the workgroup finds important, do not correspond with the aspects that the respondents find important. The aspects do not measure the key concepts cites by the respondents, and therefore, the respondents did not mention indicators corresponding to these aspects.

PRACTICE DEFINITION AND INDICATORS

Remarkably, the areas the respondents think should be measured differ from the facets they define as constituting quality. Two of the indicators mentioned by the respondents are related to the aspect ‘organisation’, but the respondents do not mention ‘organisation’ as a quality facet. In addition, the respondents do not mention indicators corresponding to half of the quality facets.

The discrepancy between the facets and indicators shows that the potential indicators given by the respondents are not a reference for what they see as quality. The respondents may not know what indicators can measure what they see as ambulance service quality. They may be mentioning the features that come to mind as things they think are measurable, instead of the those that fit with their perception of ambulance service quality.

This difference between quality indicators and the definition of quality is also apparent in the international literature. Based on the given categorisations, four quality aspects were defined. ‘Documents & protocols’, ‘adverse events’ and ‘patient outcomes’ were added based on the indicators described in the literature. ‘Documents & protocols’ and ‘adverse events’ were only

mentioned in one of the four categorisations; however since they had many related indicators these aspects were considered important for ambulance service quality.

This discrepancy could be caused by a lack of knowledge of quality and quality indicators for ambulance service. Since quality measurement for ambulance service is in its early stages, in comparison with, for example, hospitals, much is still unknown. A single uniform international definition is yet unavailable, so it is hard to define quality and how it should be measured. Most of the research discussing indicators for ambulance service does not define quality, and the present indicators measure an undefined quality.

POTENTIAL SUITABLE INDICATORS

The indicators that are mentioned in international literature and by the respondents only focus on three of the seven aspects. However, other indicators from the respondents or the literature suit the definition of ambulance service quality. Therefore, it is important to critically asses these indicators. I judged the 69 indicators described in literature and 10 indications mentioned by the respondents based on the suitability criterion that each should *align with the definition of ambulance service quality, has as many as advantages as possible, has as few disadvantages as possible and is preferably evidence based*. Aligning with the definition, advantages, disadvantages and extent of being evidence based are scored from strongly negative to strongly positive agreement. When all the criteria are positive, the indicators are judged suitable (Appendix 6).

Of the 26 disease-specific indicators, 25 are suitable according to these criteria. In addition, 16 of the 43 generic indicators are only positive scored. Lastly four of the 10 indicators from the respondents are judged suitable. The respondents' and the generic indicators are combined.

The 41 suitable indicators are an addition to the suitable indicators in the conclusion. They can also be considered as potential indicators for the Dutch ambulance context. These indicators can help to cover the seven aspects of quality.

6.2 LIMITATIONS OF THE RESEARCH

Since this research took place over a period of 21 weeks. This restriction in time and resources has inevitably led to a few choices, which had a negative influence on the quality of this research.

I systematically searched in English literature for research about quality indicators for ambulance services. Despite this thorough search, important articles can be missed.

Of the 16 interviewed respondents, 15 work in a single Dutch ambulance organisation. The other respondent works in the umbrella organisation. People from other organisations were not interviewed. People working in other ambulance organisations may have different opinions about quality and quality measurement. The choice to interview people in the same organisation could have created a bias in the results.

I found no difference in quality definitions or quality measurements from region to region, however this may be caused by too little variation in respondents and observation locations. The nurses, drivers, managers and policy advisors work on a national level and in different regions in the Netherlands. I did not interview representative from every ambulance region in the Netherlands. All the observations were in one ambulance region. This may produce a bias in the results.

Interviews with nurses and drivers were in a cafeteria with other nurses and drivers in the room. The nurses and drivers may not have wanted to speak truthfully, since they knew that others were listening. This may have influenced the answers that they gave.

I interviewed 16 respondents during this research and data saturation seemed to be reached. Nevertheless, the data collection may have been stopped too soon. Sometimes it may seem as though data saturation is reached, when this is not actually the case. This can happen when the sample of respondents is too small and when the interview questions, data collection or analyses lack depth (49).

Since I used opportunistic sampling for the interviews with nurses and drivers, I may have missed crucial information from important people (49). Because I interviewed the people that I could interview the most easily or quickly, I may not have gotten the best possible results from the sample (51).

Since it was not possible to travel with an ambulance, I was not able to see ambulance service in practice. The observation was thus only of a small part of ambulance service: the ambulance post. Therefore, the conclusions on how indicators fit into the context are mainly based on interviews and documents.

The documents I collected are based on documents mentioned in interviews, sent by employees of the ambulance organisation and documents I could find on the websites of the AZN and the ambulance blog. Although I searched thoroughly for relevant documents, there may be important documents missing.

I did not use member check, although this could have contributed to the internal validity (49, 50). I also did not use research triangulation for the analysis. If another student had checked the codes, the analysis might have been less influenced by my opinion (49).

6.3 INFLUENCE OF THE RESEARCHER

Since the researcher is the research instrument in qualitative research, it is important to be critical of my influence on this research. I came into this research as an outsider. Aside from reading some policy documents and literature about ambulance service, I knew little about the subject. I did not know the context or the respondents before I started the research. Normal everyday things for the respondents, were unusual for me. Therefore, I could make what was implicit for the respondents explicit. In this way, I may have influenced the respondents, although I did not participate in the research.

Prior to the data collection, I recorded my expectations for the results. As I expected, the international literature described more indicators than are currently used in Dutch ambulance service. In contrast to my expectations, ambulance service quality is measured ways other than response time. In addition to patient outcomes, which I expected, respondents also find other facets important for ambulance service quality. I also expected a big difference between the group comprising nurses and drivers and the group comprising policy advisors and managers; however, this difference was relatively small.

6.4 RECOMMENDATIONS FOR FUTURE RESEARCH

Patients are important stakeholders in ambulance service. However, they were not interviewed in this research nor were they involved in the development of the AZN indicators. Therefore, it is important to investigate their opinions on ambulance service indicators in future research.

Another group of stakeholders that was not interviewed were the insurance companies. They pay for the ambulance services and they could use indicators as part of their negotiations. Therefore, their perspective on the development of quality indicators could be of interest to future research.

Nurses, drivers, managers and policy advisors in other organisations may have other definitions of quality and want to measure ambulance service quality other ways. Therefore,

conducting research in other organisations could help to get insight into suitable quality indicators for Dutch ambulance service.

The suitable indicators focus on three aspects of ambulance service quality: ‘organisation’, ‘staff’ and ‘patient outcomes’. To adequately measure ambulance service quality, all aspects of ambulance service quality need to be measured. Therefore, indicators for the other aspects of ambulance service quality: ‘material facilities’, ‘care provision’, ‘documents & protocols’ and ‘adverse events’ should first be researched. This would strengthen and complete the set of indicators for Dutch ambulance service quality.

6.5 RECOMMENTATIONS FOR POLICY

I would advise Dutch ambulance service four things. Critically reflect with people from science, policy and clinical practice on the currently implemented indicators. Improve and remove unsuitable indicators.

Search for ways to measure patient satisfaction on a more regular basis. Patient satisfaction is agreed upon by science, policy and clinical practice and currently used; however, an improvement would be if it were measured on a regular basis.

Since there are many more potential quality indicators for ambulance service than currently used, the set of quality indicators could be expanded. First, I would advise considering the rate of non-emergency calls, prior education, accreditation, assessment of ambulance personnel and patient satisfaction. These indicators are important in practice and international literature.

Expand the ambulance service indicators to incorporate suitable indicators from aspects where no indicators are currently available: ‘material facilities’, ‘care provision’, ‘documents & protocols’ and ‘adverse events’.

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APPENDIX 1 TOPIC LISTS

TOPIC LIST AMBULANCE NURSES AND DRIVERS

What do you perceive as a good quality of ambulance care?

- Professional knowledge
- Patient/societal level

How is Dutch quality of ambulance care assured?

- Ambulance care laws
- Protocols & guidelines
- Education
- Filing of complaints and incidents

How is ambulance care quality currently measured?

- Level
- Quality indicators

How do quality indicators influence the way you work?

How do you think that quality of ambulance care should be measured?

What are the three most important aspects for measuring quality of ambulance care?

How do you think that measuring these aspects fits in your daily work?

TOPIC LIST POLICY ADVISORS AND MANGAERS

What do you perceive as a good quality of ambulance care?

- Professional knowledge
- Patient/societal level

How is Dutch quality of ambulance care currently assured?

- Ambulance care laws
- Protocols & guidelines
- Education
- Filing of complaints and incidents

How is the quality of ambulance care currently measured?

- Level
- Quality indicators

What do you perceive as the risks/disadvantages of using quality indicators in ambulance care?

What do you perceive as advantages of using quality indicators in ambulance care?

How do you think that quality of ambulance care should be measured?

What are the three most important aspects for measuring quality of ambulance care?

How do you expect that measuring these aspects will influence the daily practice of ambulance care?

COMBINED TOPIC LIST (WITH ANOTHER THESIS)

1. How would you define quality of ambulance care?
2. How does your understanding of quality influence your professional behaviour?

3. How is quality of care assured? (in practice)

4. How is quality currently measured in ambulance care?
5. How do the current quality measurements influence your professional behaviour?

6. What do you perceive as the risks/disadvantages of using quality indicators in ambulance care?
7. What do you perceive as advantages of using quality indicators in ambulance care?

8. How do you think that quality should be measured? (What are the three most important aspects for measuring quality of ambulance care?)
9. How do you expect that measuring these aspects will influence the daily practice of ambulance care?

10. Are there regional differences in terms of ambulance care organization?
11. Are there any changes in the way ambulance care is organized in the past 5 years in terms of quality improvement? If yes what are the reasons for change?

Last questions:

12. If you should choose would you treat patients at site or transport them as quick as possible?
13. Is safety a good quality indicator for ambulance care? (and so yes why)

Is emergency medicine recognized as a specialty in this country? How does it influence the quality of care?

APPENDIX 2 RESPONDENTS

Table 6: respondents

Respondent	Gender	Institution	Function	Duration of interview
1	Female	AZN	Policy advisor	1 hour and 1 minute
2	Female	Ambulance organisation	Policy advisor	1 hour
3	Male	Ambulance organisation	Medical manager	1 hour and 21 minutes
4	Male	Ambulance organisation	Educational manager	40 minutes
5	Male	Ambulance organisation	Operational manager	50 minutes
6	Male	Ambulance organisation	Operational manager	48 minutes
7	Male	Ambulance organisation	Operational manager	1 hour and 6 minutes
8	Female	Ambulance organisation	Planned nurse	unknown
9	Male	Ambulance organisation	Planned nurse	unknown
10	Male	Ambulance organisation	Planned nurse	unknown
11	Male	Ambulance organisation	Planned driver	13 and a half minutes
12	Male	Ambulance organisation	Planned driver	unknown
13	Male	Ambulance organisation	Planned driver	unknown
14	Male	Ambulance organisation	Emergency nurse	38 minutes
15	Male	Ambulance organisation	Emergency nurse	unknown
16	Male	Ambulance organisation	Emergency driver	Unknown

APPENDIX 3 CODES

FIRST VERSION:

Time

Administrative burden

Patient satisfaction

Education

Uniform registering

Behaviour towards patients

Equipment

Benchmark

Filter bad/ improve care

Do your job

Chain partners

Validity and reliability

Decoupling

Non-emergency calls

Expectation vs reality

SECOND VERSION:

HOW NOW ENSURED/MEASURED:

- Current quality instruments
- Education
- Laws & regulations
- AZN indicators
- Patient satisfaction
- Time
- Equipment
- Medical care

DEFINITION:

- Patient-centred
- Patient satisfaction
- Education
- Equipment
- Behaviour towards patients
- Do your job
- Driving behaviour
- Transportation

HOW SHOULD QUALITY BE MEASURED:

- Education
- Behaviour towards patients
- Chain partners
- Expectation versus reality
- External control

RISKS:

- Reporting burden
- Uniform reporting
- Quality of indicators
- Decoupling
- Unmeasurable

ADVANTAGES:

- Benchmark
- Filter the bad out/ improve care
- Show others

APPENDIX 4 USED DOCUMENTS

Ambulancezorg Nederland:

- Ambulances in zicht (2012)
- Basisset Ambulancezorg (BSA) versie 2.0 (2015)
- Beleidsnotitie en convenant Dynamisch ambulancemanagement (2009)
- Bijlagen Implementatieplan Indicatoren Ambulancezorg (2015)
- Branche richtlijn Optische en geluidssignalen (2016)
- Deskundigheidsgebied en eindtermen opleiding tot Ambulanceverpleegkundige (2012)
- Functiegebied Medisch Management (2009)
- Handreiking gebruik bsn binnen ambulancezorg (2009)
- Hygienerichtlijnen voor Ambulance (2012)
- Imago-onderzoek ambulancezorg (2012)
- Informatiebeveiliging in de ambulancezorg, brochure (2015)
- Inzet- en cancelcriteria MMT - LNAZ-AZN (2013)
- Juridisch kader Inzet Centralist MKA (2009)
- Juridisch kader Standaarden en protocollen (2005)
- Juridisch kader Verantwoordelijkheidsverdeling in de ambulancezorg (2005)
- Kernset 2013 (2013)
- Kwaliteitskader acute psychiatrie ambulancezorg (2015)
- Kwaliteitskader first responder versie 1.0 (2015)
- Kwaliteitskader zorgambulance (2014)
- Landelijk convenant opleiden trainen oefenen (2008)
- Landelijke Onderzoeksagenda Ambulancezorg 2014-2018 (2014)
- Landelijk Protocol Ambulancezorg versie 8.1 (2016)
- Model afspraak Slachtofferinformatie RAV-DPG (September 2015)
- Model opschalingsplan ambulancezorg (2014)
- Modelovereenkomst GHOR-RAV (2015)
- Modelrichtlijn en modelvoorlichtingsmateriaal autorisatie voor toegang tot het e-spoeddossier versie 1.0 (Februari 2007)
- Nationaal Nummerplan Ambulancezorg Nederland versie 5.5 (2017)
- Nota verantwoorde ambulancezorg (2013)
- Notitie Regionaal Overleg Acute Ketenzorg (2005)
- Uitvraagbestand MI (2016)
- Plan van Eisen MKA-triagesysteem (2011)
- Professioneel Statuut MMA (2013)
- Protocolontwikkeling ambulancezorg definitief (2011)
- Richtlijn Ambulancezorg op het water (2009)
- Richtlijn Beroepsgeheim binnen de ambulancezorg (2009)

- Richtlijn Gegevensuitwisseling huisarts-ambulancedienst-afdeling SEH (2009)
- Richtlijn Grensoverschrijdende communicatie (2009)
- Richtlijn Verwerking van Geluidsgegevens Meldkamer Ambulancezorg (2009)
- Uniform Begrippen Kader (2013)
- Verantwoorde ambulancezorg houdt je scherp brochure voor ambulance professionals (2014)

College Zorg Opleidingen:

- Opleidingseisen van de opleiding tot ambulancechauffeur versie 1.2 (2017)
- Opleidingseisen ambulanceverpleegkundige versie 1.1 (2017)

OTO:

- Kwaliteitskader Crisisbeheersing en OTO (2013)
- Kwaliteitskader Crisisbeheersing en OTO Addendum (2014)
- Landelijk beleidskader OTO (2012)

Ministry of Healthcare:

- Kamerbrief: Bekostiging ambulancezorg 11 juni 2013
- Kamerbrief: Actualisatie referentiekader spreiding en beschikbaarheid 16 juli 2013
- Referentiekader Spreiding en Beschikbaarheid Ambulancezorg (2013)

The Health Care Inspectorate (IGZ):

- Rapport herinspectiebezoek op 20 november 2015 aan RAV Ambulance Amsterdam (2015)
- Verslag van het bezoek aan Regionale Ambulance Voorziening Ambulance Amsterdam 01 april 2016 te Amsterdam (2016)
- https://www.igz.nl/onderwerpen/curatieve-gezondheidszorg/ambulancezorg/

Nederlandse Vereniging van Ziekenhuizen (NVZ):

- Zicht op zorg: Acute zorg (2013)

Zorginstituut Nederland

- Toetsingskader kwaliteitsstandaarden, informatiestandaarden & meetinstrumenten (2015)

Nivel:

- Eindrapport CQI Spoedeisende Ambulancezorg (2013)
- Kwaliteit van ambulancezorg vanuit het perspectief van cliënten (2017)

Ambulance organisation x:

- Kwaliteitshandboek 2016-08-26

SOVAM:

- Werkpakket psychische belasting ambulancezorg (2008)
- Praktijkrichtlijnen fysieke belasting ambulancezorg (2005)

Other guidelines:

- Richtlijn eerste veiligheidsmaatregelen bij verkeersincidenten (2012)
- Richtlijn Incident management bij plus en spitsstroken (2003)

Laws:

- Wkkgz (Quality, Complaints, Disputes Healthcare Act);
- WMCZ (Client participation Health Institutions Act);
- WTZi (Care Institutions Eligibility Act);
- Wmh (Medical Devices Act);
- BOPZ (Compulsory Admission to Psychiatric Hospitals Act);
- WBP (Personal Data Protection Act);
- Wvr (Safety Regions Act)
- WGBO (Medical Treatment Agreement Act)
- BIG (Individual Healthcare Professions Act).
- WvW (Road Traffic Act)
- RVV (Road Traffic and Traffic Signals Regulations Act)

APPENDIX 5 LOGBOOK

Week number	Goals	Tasks
10	10-03	Pass thesis plan
	10-03	Adjust thesis plan with feedback
11	13-03	Approach respondent AZN
	13-03	Start writing introduction and theoretical framework
	14-03	First data collection (literature review)
	15-03	Data collection (literature review)
	17-03	Group meeting 2: theoretical framework
12	20-03	Set date interview policy advisor 2
13	27-03	Group meeting with the Organisation x - Meeting about data gathering - Update about process
	27-03	Reschedule interview policy advisor 2
	28-03	Improve Theoretical Framework and introduction with feedback group meeting. Start writing method section
	29-03	Improve method section
	30-03	Mailing 4 respondents about scheduling interviews Interview with policy advisor 1 planned
	31-03	Improve method section and introduction Hand in method, introduction and theoretical framework Set date with manager 2
	03-04	First mail for date with operational manger 1 Interview with operational manager 3 planned
	04-04	Group meeting 3: methods Mailing operational manger 1 and policy advisor 2 for interviews
15	07-04	Interview with policy advisor 2 planned
	10-04	Interview with manager 1 planned
	14-05	Plan dates for possible observations Email to ministry of health asking to participate in this research
16	17-04	Improve methods Start document analysis Write expectations results Hand in thesis Mail and set date for interview operational manager 1
	18-04	Document analysis Response from the ministry of health responding they will not participate in this research

	19-04	Interview Operational manager 1
	20-04	Interview policy advisor 1
	21-04	Group meeting 4: analysis and results
	22-04	Transcribe interview 1 (operational manager 1) and document analysis
	23-04	Transcribe interview 1 (operational manager 1) and document analysis
17	24-04	Transcribe interview 1 (operational manager 1) Set date for observation 26 April and 3 may
	25-04	Interview policy advisor 2 Finish transcript interview 1 and sent to respondent (operational manager 1). Email to ministry of health asking about their responsibility and the responsibility of AZN
	26-04	Observation day 1 Interview operational manager 3, manager 1, emergency nurse 1, emergency nurse 2, planned nurse 3, planned driver 3, planned driver 1 Interview with operational manager 2 planned Response from the ministry of health about their responsibility, the responsibility of AZN and of The Health Care Inspectorate (IGZ).
18	01-05	Transcribe interview 2 (policy advisor 1) Received transcript (operational manger 3)
	02-05	Received transcript (emergency nurse 2)
	05-05	Transcribe interview 2 and sent to respondent (policy advisor 1)
19	09-05	Observation day 2 Interview planned nurse 2, planned driver 2, planned nurse 1, emergency driver 1
	10-05	Interview manager 2 and operational manger 2
		Group meeting 5: discussion
20	16-05	Transcribe interview 3 (policy advisor 2)
	21-05	Transcribe interview 3 (policy advisor 2) Receive first half of interview 4 (manager 2)
21	23-05	Translate Dutch parts of interviews with manager 2, operational manager 3 and emergency nurse 2 Transcribe interview 4 (manager 2)
	24-05	Transcribe interview 4 (manger 2)
	25-05	Finish transcript interview 4 and sent to respondent (manager 2)
	26-05	Transcribe interviews 5 (planned driver 1) and 6 (operational manager 2)
	27-05	Finish transcript 6 (operational manager 2) and 3 (policy advisor 2) and sent to respondents

		Analyse interviews
	28-05	Analyse interviews, Write result section.
22	29-05	Write result section
	30-05	Write result section and start with conclusion
	01-06	Write methods section, results section, conclusion start with discussion
	02-06	Improve theoretical framework Meeting 6: about draft thesis
	03-06	Improve introduction and theoretical framework
	04-06	Improve theoretical framework
23	05-06	Improve theoretical framework
	06-06	Improve results section
	07-06	Improve results section, conclusion and discussion
	08-06	Improve result section, conclusion and discussion
	09-06	Improve theoretic framework, result section, conclusion and discussion
	10-06	Improve introduction and theoretic framework
	11-06	Improve result section
24	12-06	Improve discussion and conclusion
	13-06	Translate Dutch quotes and remove words
	Deadline thesis **14th of June** **13:00**	**Hand in thesis**
	20-06	No-pass supervisor
25	21-06	Feedback conversation supervisor
	22-06	Rewrite theoretical framework
	23-06	Rewrite theoretical framework
26	26-06	Rewrite theoretical framework
	27-06	Rewrite results section
	28-06	Rewrite results section
	29-06	Rewrite results section and conclusion
	30-06	Rewrite conclusion
27	03-07	Rewrite introduction ant theoretical framework
	04-07	Rewrite theoretical framework
	05-07	Rewrite theoretical framework and conclusion
	06-07	Rewrite discussion
	07-07	Rewrite discussion
	09-07	Rewrite conclusion
28	10-07	Rewrite discussion
	11-07	Send question to supervisor, receive answer
	12-07	Rewrite theoretical framework and result section
	13-07	Rewrite result section and conclusion

	14-07	Rewrite conclusion, discussion and summary
	16-07	Rewrite discussion
29	17-07	Rewrite discussion
	18-07	Improve lay-out
30	26-07	Improve English
	27-07	Improve English
	30-07	Improve English
31	01-08	Improve tables
	02-08	Check thesis on small mistakes
	03-08	Check thesis on small mistakes
	05-08	**Last check and hand in thesis**

APPENDIX 6 SUITABLE INDICATORS REVIEW

Table 7: Review Generic Literature indicators

Group	Quality Indicator	Definition	Advantages	Disadvantages	Evidence based
STRUCTURE	Proportion of population living within 10 kilometres of emergency or urgent care facilities open for more than 12 hours per day and 7 days per week.	-	+/-	+/-	+
	Rate of on-scene clinical/ operational leader for incidents where 3 or more ambulances have been tasked, or the presence of 5 or more casualties	-	+/-	+/-	+
	Training and education of the ambulance personnel	**++**	**+**	**+**	**++**
	Rate of annual clinical appraisal of practitioners	**++**	**+**	**+**	**+**
	Availability of equipment	++	++	+	+/-
	Availability of life saving drugs and oxygen	++	++	+	+/-
	Availability of dispatch criteria	+	+	-	+/-
	Availability of protocols	**+**	**++**	**+**	**+**
	Access to electronic/ online medical education resources	+/-	+	+	+
	Access to performance measurement data	-	+	+	+/-
	Clinical audit rate of patient care report forms	+/-	+	+	+
PROCESS	**Transport to appropriate facility**	**++**	**++**	**+**	**+**
	Arrivals at EDs referred by emergency ambulance and discharged without treatment or investigations(s) that needed hospital facilities.	**+**	**+**	**+**	**+**
	Measuring lactate level	+	+	+	+/-
	Measuring blood pressure and heart rate	+	+	+	+/-
	Measuring pain score	**+**	**+**	**+**	**++**
	Measuring patient satisfaction with survey	**++**	**+**	**+**	**+**
	Frequency and patterns of protocol usage	+	+	+	+/-
	Adherence to evidence-based good practice guidelines	**++**	**++**	**+**	**+**
	Rate appropriate intervention with acute pain	**+**	**++**	**+**	**+**
	Completeness of clinical documentation	+/-	++	+	++
	Rate of injury to patient during EMS phase of care (e.g. fall from stretcher)	**+**	**+**	**+**	**+**
	Incidence of occupational injuries and illnesses	-	+/-	-	+
	Staff satisfaction rate	-	+/-	-	+
	Staff absenteeism rate per year	-	+/-	-	+

Group	Quality Indicator	Definition	Advantages	Disadvantages	Evidence based
OUTCOME	Response time	+	+	-	-
	Total prehospital time (with component parts)	+	+	-	+/-
	Time between calling and being treated	+	+	+	-
	Average time interval of completion patient handover on ED arrival	+/-	+	+	+
	Rate of successful endotracheal intubation	**++**	**++**	**+**	**+**
	Rate of oxygen saturation improvement post O2 administration	**+**	**++**	**+**	**+**
	Patient Satisfaction	**++**	**++**	**+**	**+**
	Improvement in pain score	**+**	**+**	**+**	**++**
	Long term patient outcomes	+	+	+	-
	Pre-hospital deaths/ In-hospital deaths	++	+	-	-
	Mortality rates/ Case fatality ratios for serious, emergency, conditions for which a well-performing EUCS could improve chances of survival.	**++**	**+**	**+**	**+**
	Peer review for preventable deaths	++	+	+	-
	Complaint rate of overall patient interactions	**++**	**+**	**+**	**+**
	Ambulance road traffic collision rate on AS1 Emergency Call	-/+	+/-	+/-	+/-
	Assault on pre-hospital practitioner per 10000 hours worked	-	+/-	+/-	+/-
	Number of patients admitted to hospital within 14 days of their emergency ambulance attendance who were judged to have been inappropriately left at the scene by their attending crew	+	+	+	+/-
	Rate of adverse events	+	+	+	+/-
	Healthcare cost per capita	-	-	-	-

dark blue: organisation, yellow: staff, red: material facilities, turquoise: care provision, green: documents & protocols, orange: adverse events, pink: patient outcomes, Bolded letters= suitable indicators

Level of agreement:

-- strong negative, - minor negative, +/- not positive and not negative, + minor positive, ++ strong positive

Criteria for definition: relates to patient centred, patient experience, skilled staff, equipment and/or transportation
Criteria for advantages: can be used for benchmark, care improvement and/or practice-based evidence
Criteria for disadvantages: has the minimal administrative burden, decoupling, distrust, injustice and/or waste of resources
Criteria for evidence based: is specific & sensitive, valid & reliable. The indicator is also relevant for and applicable to clinical practice

Table 8: review disease-specific literature indicators

Group	Clinical bundle	Definition	Advantages	Disadvantages	Evidence based
Structure	**Cardiac arrest**	+	++	+	++
	Spinal Cord Injury	+	++	+	++
	ST Elevation Myocardial infarction (STEMI)	+	++	+	+
	Pulmonary Edema	+	++	+	+
Process	**Cardiac arrest**	+	++	+	++
	Stroke /TIA	+	++	+	++
	Acute asthma	+	++	+	++
	Hypoglycaemia	+	++	+	++
	ST Elevation Myocardial infarction (STEMI)	+	++	+	++
	Acute myocardial infarction (AMI)	+	++	+	++
	Spinal Cord Injury	+	++	+	++
	Trauma	+	++	+	+
	Seizure	+	++	+	+
	Sepsis	+	++	+	+
	Paediatric	+	++	+	+
	Pulmonary Edema	+	++	+	+
Outcome	**Cardiac arrest**	+	++	+	++
	Acute myocardial infarction	+	++	+	++
	Stroke/ TIA	+	++	+	+
	Seizure	+	++	+	+
	Hypoglycaemia	+	++	+	+
	ST Elevation Myocardial infarction (STEMI)	+	++	+	+
	Pulmonary Edema	+	++	+	+
	Acute asthma	+	++	+	+
	Trauma	+	++	+	+
	Sepsis	+	++	+	+/-

turquoise: care provision, **Bolded letters**= suitable indicators

Level of agreement:
-- strong negative, - minor negative, +/- not positive and not negative, + minor positive, ++ strong positive

Criteria for definition: relates to patient centred, patient experience, skilled staff, equipment and/or transportation
Criteria for advantages: can be used for benchmark, care improvement and/or practice-based evidence
Criteria for disadvantages: has the minimal administrative burden, decoupling, distrust, injustice and/or waste of resources
Criteria for evidence based: is specific & sensitive, valid & reliable. The indicator is also relevant for and applicable to clinical practice

Table: review respondent's indicators

Aspect	Quality Indicator	Definition	advantages	Disadvantages	Evidence based
Organisation	non- emergency calls	+	+/-	+/-	-
	chain of care	+/-	+	+/-	+/-
Staff	**prior education**	**++**	**+**	**+**	**++**
	accreditation	**++**	**+**	**+**	**++**
	assessment	**++**	**+**	**+**	**+**
	amount of restricted procedures	++	+	+	+/-
	time on the ambulance	+	+	+	-
	driver style	++	+	+	+/-
	social skills of nurses & drivers	++	+	-	-
Patient outcomes	**patient satisfaction**	**++**	**++**	**+**	**+**

dark blue: organisation, yellow: staff & pink: patient outcomes, **Bolded letters**= suitable indicators

Level of agreement: -- strong negative, - minor negative, +/- not positive and not negative, + minor positive, ++ strong positive

Criteria for definition: relates to patient centred, patient experience, skilled staff, equipment and/or transportation
Criteria for advantages: can be used for benchmark, care improvement and/or practice-based evidence
Criteria for disadvantages: has the minimal administrative burden, decoupling, distrust, injustice and/or waste of resources
Criteria for evidence based: is specific & sensitive, valid & reliable. The indicator is also relevant for and applicable to clinical practice

Table 9: suitable indicators

Group	Quality Indicator	Definition	Advantages	Disadvantages	Evidence based
STRUCTURE	Training and education of the ambulance personnel *	++	+	+	++
	Rate of annual clinical appraisal of practitioners *	++	+	+	+
	Availability of protocols	+	++	+	+
	Cardiac arrest	+	++	+	++
	Spinal Cord Injury	+	++	+	++
	ST Elevation Myocardial infarction (STEMI)	+	++	+	+
	Pulmonary Edema	+	++	+	+
PROCESS	Transport to appropriate facility	++	++	+	+
	Arrivals at EDs referred by emergency ambulance and discharged without treatment or investigations(s) that needed hospital facilities.	+	+	+	+
	Measuring pain score	+	+	+	++
	Measuring patient satisfaction with survey	+	+	+	+
	Cardiac arrest	+	++	+	++
	Stroke /TIA	+	++	+	++
	Acute asthma	+	++	+	++
	Hypoglycaemia	+	++	+	++
	ST Elevation Myocardial infarction (STEMI)	+	++	+	++
	Acute myocardial infarction (AMI)	+	++	+	++
	Spinal Cord Injury	+	++	+	++
	Trauma	+	++	+	+
	Seizure	+	++	+	+
	Sepsis	+	++	+	+
	Paediatric	+	++	+	+
	Pulmonary Edema	+	++	+	+
	Adherence to evidence-based good practice guidelines	+	++	+	+
	Rate appropriate intervention with acute pain	+	++	+	+
	Rate of injury to patient during EMS phase of care (e.g. fall from stretcher)	+	+	+	+
OUTCOME	Rate of successful endotracheal intubation	++	++	+	+
	Rate of oxygen saturation improvement post O2 administration	+	++	+	+
	Cardiac arrest	+	++	+	++
	Acute myocardial infarction	+	++	+	++
	Stroke/ TIA	+	++	+	+
	Seizure	+	++	+	+
	Hypoglycaemia	+	++	+	+
	ST Elevation Myocardial infarction (STEMI)	+	++	+	+
	Pulmonary Edema	+	++	+	+
	Acute asthma	+	++	+	+
	Trauma	+	++	+	+
	Patient Satisfaction*	++	++	+	+
	Improvement in pain score	+	+	+	++
	Mortality rates/ Case fatality ratios for serious, emergency, conditions for which a well-performing EUCS could improve chances of survival.	+	+	+	+
	Complaint rate of overall patient interactions	+	+	+	+

dark blue: organisation, yellow: staff, red: material facilities, turquoise: care provision, green: documents & protocols, orange: adverse events, pink: patient outcomes, *=also mentioned by respondents

Level of agreement:
-- strong negative, - minor negative, +/- not positive and not negative, + minor positive, ++ strong positive

Criteria for definition: relates to patient centred, patient experience, skilled staff, equipment and/or transportation
Criteria for advantages: can be used for benchmark, care improvement and/or practice-based evidence
Criteria for disadvantages: has the minimal administrative burden, decoupling, distrust, injustice and/or waste of resources
Criteria for evidence based: is specific & sensitive, valid & reliable. The indicator is also relevant for and applicable to clinical practice

APPENDIX 7 EXPECTATIONS BEFORE DATA COLLECTION

I foresee that there will be more indicators described in international literature, than currently used in ambulance care. This will be a combination of structure, process and outcome indicators. In addition, there will be a combination of general and disease-specific indicators for ambulance care. However little of these indicators will be used in practice and a lot of them have disadvantages.

My expectation is that quality of ambulance care is not measured well at this moment. The only indicator used is response time. I think ambulance professionals will find this an inadequate way of measuring quality of ambulance care. In addition, I expect that a lot is done to improve and ensure the quality of ambulance care, by both policy and work in practice.

In my expectation people working in ambulance care will find it important that patient outcomes are measured with the quality indicators. The process of care delivery or facilities in the ambulance will be perceived as less important. In addition, I think they find it important that it will help improve the care instead of making the work more difficult.

I think that policy workers, policy advisors and managers will be positive about the use of quality indicators in ambulance care and want to have more indicators. Since they see the advantages of using them to improve care and show which organisation is better/more effective. However, I expect the ambulance professionals, nurses and drivers, to be more negative about quality indicators. I think they are negative about the current quality indicators but also about more quality indicators for ambulance care in the future. Because they see the disadvantages of more work and more administration. In addition, the feeling that they are watched and controlled by others, instead of improved by professionals.