Implementation of A Nurse Practitioner in Emergency Ambulance Care in The Netherlands: A Study Protocol for The IMPACT-Study

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Abstract

Background Ambulance care professionals face an increasing demand for ambulance care, which is caused by a changing patient population with more complex healthcare problems and comorbidities, accessibility of emergency care, repeated requests for ambulance care and the request of ambulance care for primary care problems. These changes might require an ambulance care professional at master level, such as the nurse practitioner (NP). The objective is to (1) determine characteristics of patients and ambulance runs in situations where NP care was provided, and to evaluate the effect of implementing the NP in Dutch ambulance on (2) patient safety and (3) patient experience compared to non-NP care.

Methods/design A prospective mixed-methods implementation design will be used. The intervention is the implementation of a NP as solo ambulance unit within this EMS, to (1) determine characteristics of the patients and ambulance runs, and the effects on (2) patient safety and (3) patient, compared to regular ambulance care. Within this pilot the NP can apply additional diagnostic and therapeutic interventions in addition to regular ambulance care. Data will be collected through databases, additional apps, and questionnaires.

Background

Ambulance care in the Netherlands is provided by 25 regional emergency medical services (EMS). An EMS can be publicly or privately organized, or it can be a combination of public and private organizations [1]. Ambulance care is dispatched through the emergency medical dispatch center, and can be requested via the national emergency number 1-1-2, or by healthcare professionals (such as the general practitioner or medical specialist). The dispatch center is staffed by a dispatch nurse. Dispatch is either guided by the Advanced Medical Priority Dispatch System in its digital form of Professional Quality Assurance (ProQA), or the Dutch Triage Standard (NTS). The dispatch center can dispatch a fully equipped ambulance or a solo vehicle (car or motorcycle). Ambulance care can be dispatched with three priority levels: A1: an acute threat to the patient's vital functions or only to be excluded after an evaluation by the ambulance unit on site (response time < 15 minutes), A2: a request for care that does not entail an immediate threat to life, but may involve (serious) damage to health (response time < 30 minutes), or B: Planned patient transport.

Regular ambulances in the Netherlands are staffed with one driver and one ambulance care professional, being either a registered nurse or a bachelor of health. A registered nurse becomes qualified as an ambulance nurse after following a specific national training course at Dutch Qualification Framework, NLQF-level 6. The position of a bachelor or health ambulance care is relatively new in the Dutch ambulance care system. A bachelor of health has followed a four-year educational program at bachelor level at NLQF-level 6. Both the nurse and the bachelor of health follow a national ambulance care course and are examined by the national ambulance care academy. Dutch ambulance care professionals have a functional autonomy within the framework of the national EMS standard. This standard covers 113 flowcharts with decision making strategies on diagnosis and treatment of signs and symptoms of 15 diagnosis groups e.g. airway, cardiology, internal medicine and trauma care.

These ambulance care professionals face an increasing demand for ambulance care, which is caused by a changing patient population with more complex healthcare problems and comorbidities, accessibility of emergency care, repeated requests for ambulance care and the request of ambulance care for primary care problems [2–6]. This changes calls for different types of ambulance care, provided by different types of ambulance care professionals that have additional competencies and diagnostic and treatment options.

A possible solution to provide care to a changing prehospital patient population and limit the burden on the ambulance care system might be a professional at master level, such as a nurse practitioner (NP). The NP is a Master of Science educated nurse (NLQF/EQF level 7) who has completed the Master Advanced Nursing Practice [7]. NPs are qualified and allowed to indicate and perform some of the so-called “reserved procedures”, and combine nursing care with medical care. The NP comes to a differential diagnosis based on clinical reasoning. Using; medical history, physical and/or psychiatric examination and/or additional diagnostics.

Several reviews about the effect of NPs in primary, ambulatory or emergency department care showed positive effects on patient outcomes, patient satisfaction, and cost-effectiveness [8–12]. However, these studies did not focus on the effects of implementing a NP in ambulance care. Based on these studies it is hypothesized that the implementation of a NP within EMS care might positively affect patient safety and patient experience.

Objectives

The objective is to (1) determine characteristics of patients and ambulance runs in situations where NP care was provided, and to evaluate the effect of implementing the NP in Dutch ambulance on (2) patient safety and (3) patient experience compared to non-NP care.

Characteristics of the patient and ambulance runs

1. What are characteristics of the patients (demographics, initial complaints, on-scene diagnosis) and ambulance runs (timeframes and priority levels) when NP care was provided compared to non-NP care?

Patient safety

1. What are the incidence and nature of incidents, complaints and follow-up contacts of patients consulted by a NP compared to non-NP care?
2. Which diagnostic and therapeutic interventions do NPs apply in addition to regular ambulance care?
3. What is the degree of guideline adherence of the NP?

Patient experience

1. How do patients experience the care delivered by the NP?

Methods

Design

A prospective mixed-methods implementation design will be used. In concordance with Dutch legislation, a waiver of a medical ethical committee will be requested.

Intervention and setting

The intervention consists of the implementation of a NP as solo ambulance unit within this EMS. The NP is a Master of Science educated nurse (NLQF/EQF level 7) who has completed the Master Advanced Nursing Practice. The NP is registered in the specialists register of the Dutch Law. The NP can lawfully enter into an independent

treatment relationship with a patient. The NP makes a differential diagnosis on basis of clinical reasoning, using; medical history, physical and/or psychiatric examination and additional diagnostics (14). Subsequently, the NP will apply evidence-based interventions, and indicate and perform reserved procedures. NPs are legally allowed to independently indicate and perform reserved procedures, like giving injections or prescribing medication.

Subsequently, he will apply evidence-based interventions, and indicate and perform reserved procedures. The nature of the reserved procedures are described as follows: performing surgical interventions; performing catheterization; giving injections; performing punctures; performing elective cardioversion or defibrillation; performing endoscopies; prescribing medication.

The NP will be implemented in one EMS organization in the southern part of the Netherlands. Within this region reside approximately 1.8 million people, and the EMS preformed 153.000 ambulance runs in 2018. Within this EMS organization there are two emergency medical dispatch centers and 64 ambulances available. This EMS covers three main urban areas: Tilburg, Breda and Den Bosch. The NP will be deployed only in the Tilburg area (220.000 inhabitants) during daytimes starting at 07AM till 10PM. The rationale for this timeframe is to ensure on-scene safety of the NP as he attends the scene alone.

Within this pilot the NP can apply diagnostic and therapeutic interventions in addition to regular ambulance care. The three additional diagnostic interventions are point of care tests (a) urinalysis and (b) ultrasound, and (c) otoscope. The four additional therapeutic interventions are (a) procedural sedation and analgesia, (b) surgical closure of wounds, (c) prescription of medication, and (d) thoracostomy. All additional interventions, their indications, options and evidence-based underpinning are described in Table 1.

Additional diagnostic interventions

Point-of-care testing (POCT) is defined as an investigation taken at the time of the consultation with instant availability of results to make immediate and informed decisions about patient care. Within this pilot, the NP can apply 'urinalysis', 'ultrasound' or otoscopies as POCT.

Urinalysis using multi-analytic dipsticks contain discrete reagent pads to semi-quantitatively test for the presence of bilirubin, blood, creatinine, glucose, ketones, leukocytes, nitrite, pH, protein, specific gravity, and urobilinogen in a urine sample. The urinalysis is performed conform the guideline 'Urinary tract infections' of the Dutch College of General Practitioners [13]. Indication to apply urinalysis is any suspected pathology of the Urogenital Tract System, e.g. suspected urinary tract infections, trauma, kidney calculi, fever, undefined abdominal complaints.

Point of care ultrasound (POCUS) refers to the use of portable ultrasonography at a patient's side for diagnostic or therapeutic purposes. Indications to apply POCUS are abdominal trauma, thoracic trauma, out-of-hospital cardiac arrest, fascia iliac compartment block, intravenous cannula placement, intubation check, collapse, abdominal pains, and non-traumatic thoracic complaints.

Otoscopy is performed in concordance with the guideline 'Otitis Externa' of the Dutch College of General Practitioners [19]. Indication to apply the otoscope is any suspected pathology of the outer- and inner-ear canal and tympanic membrane, e.g. pain, trauma, (suspected) foreign body, vertigo and loss of hearing.

Additional therapeutic interventions

Procedural sedation and analgesia (PSA), commonly referred to as “conscious sedation” or “procedural sedation,” is to alleviate anxiety, decrease pain, and provide amnesia to patients undergoing painful procedures or diagnostic imaging. Within this pilot, PSA is performed in concordance with the guideline ‘sedation and/or analgesia (PSA) outside the operation room’ of the Dutch Society of Anesthesiology and the Dutch Society of Pediatrics [21]. PSA is applied to make short, extremely painful procedures possible.

Surgical wound closure facilitates the biological event of healing by joining the wound edges and is performed in accordance with the guideline ‘Traumatic and bite wounds’ of the Dutch College of General Practitioners [23]. The guideline recommends to glue a wound if it is clean, superficial, non-gaping, and exists shorter than 12 hours. To stitch a wound, the wound should be clean, non-infected, created by a sharp object, the skin should be non-bruised, and should not exist longer than 18 hours, except wounds in the neck/head area (within 24 hours).

A prescription medication or prescription medicine is a pharmaceutical drug that legally requires a medical prescription to be dispensed. Within this pilot the NP can prescribe medication using the guidelines from the Dutch college of General Practitioners.

A thoracostomy is a small incision of the chest wall, with maintenance of the opening for drainage, and is most commonly used for the treatment of a pneumothorax. Indications to apply a thoracostomy are a tension pneumothorax, hemothorax, and a Traumatic out of hospital cardiac arrest.

Outcomes

To assess the effect of the implementation of the NP within the EMS-system three domains with outcomes are defined: (1) patient and ambulance run characteristics, (2) patient safety, and (3) experience. All outcomes, data sources and analytical methods are displayed in Table 2.

Patient and ambulance run characteristics

For each ambulance run, dispatch data, demographics, initial reasons for care, and vital functions or observational scales are collected. The demographic variables include age, gender and geographical location. Geographic location is divided in five categories, based on home address per km², from highly urban to highly rural. The variable ‘initial reason for care’ consists of the 22 different chapters of the International Statistical Classification of Diseases and Related Health Problems 10th revision ICD Version:2016 [27]. The vital signs and observation scales involved different variables based on the ABCDE-method, and are based on the national protocol which ambulance care professionals in the Netherlands use to make their treatment and conveyance decisions.

Safety

Safety is operationalized into three indicators:

- The number of complaints or major/minor incidents reported that are related to provided NP care
- Follow-up care within 24h, 48h or 72h after non-conveyance, categorized into emergency follow-up care (ambulance, ED and GP out-of-hours office) or regular care (GP, other)
- The degree of guideline adherence for each additional intervention, conform the legal guidelines

Patient experience

To collect data on patient experience a questionnaire was developed, based on the validated Consumer Quality Index Emergency Ambulance Care (CQI-index) [28]. This CQI-index is a 46-item validated questionnaire to measure patient experience on the domains (1) emergency number and dispatch center, (2) attitude and behavior of the ambulance professional, (3) treatment by the ambulance professional, (4) communication by the ambulance professional, (5) conveyance, and (6) emergency department. As this study focuses on on-scene and follow-up care by a solo ambulance care unit, we only used the questions from the three domains handling (attitude and behavior), treatment and communication. Patients could answer on a 4-point scale ('no, not at all', 'yes, a little', 'yes, for the most part', 'yes, totally'), with an additional option for 'can't remember' or 'not applicable'.

After completing the ambulance consult, the NP asks the patient if he is willing to participate in the follow-up care and experience questionnaire. Patients are not eligible if the patient is <18 years, not able to speak Dutch, has no telephone, or the consult is for cannula placement for euthanasia. If a patient consents to participate, he is contacted by telephone within one month after ambulance attendance to take the questionnaire.

Data collection

Data will be collected in the subregion where the NP is implemented (Tilburg) and one other subregion with regular ambulance care (Den Bosch). All ambulance runs in a one year period from September 2019 until September 2020 in the Tilburg and Den Bosch area will be included. The data will be collected from five different (existing) data sources: (1) emergency medical dispatch center database, (2) regular ambulance runs sheets, (3) EMS database with complaints or incident reports (4) powerapps for each of the additional diagnostic and therapeutic interventions (5) telephone surveys about follow-up care patient experience with ambulance care. Each ambulance run is stored in an EMS database and has a unique identification number, which can be used to connect the five data-sources on patient level but guarantees anonymity.

Data-analysis

Data will be analyzed with SPSS version 25.0 (or higher if available). To describe data from the NP and regular care group, measures of central tendency and variability, and percentages will be calculated. To compare data between the NP and regular care group, Chi-square tests and t-tests will be performed. Statistical significance will be set at p-value < 0.05.

Declarations

Ethics approval and consent to participate

Not applicable

Consent for publication

We would like to state that all authors have read and approved the manuscript for submission.

Availability of data and materials

Not applicable

Competing interests

We have no competing interest to declare

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contributions to the conception OR design of the work: RE, RvV, JH, LV

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References

1. Ministerie, van Volksgezondheid. Welzijn en Sport. **Tijdelijke wet ambulancezorg**.2012.
2. Edwards MJ, Bassett G, Sinden L, Fothergill RT. **Frequent callers to the ambulance service: patient profiling and impact of case management on patient utilisation of the ambulance service**.*Emergency medicine journal: EMJ* 2015, 32:392–396.
3. SÃ,vsÃ, MB, KIÃ,jgaard TA, Hansen PA, Christensen EF. **Repeated ambulance use is associated with chronic diseases - a population-based historic cohort study of patients' symptoms and diagnoses**.*Scandinavian journal of trauma, resuscitation and emergency medicine* 2019, 27:46–46.
4. Jones CMC, Wasserman EB, Li T, Amidon A, Abbott M, Shah MN. The Effect of Older Age on EMS Use for Transportation to an Emergency Department. *PrehospDisaster Med.* 2017;32:261–8.
5. Booker MJ, Purdy S, Shaw ARG. Seeking ambulance treatment for 'primary care' problems: a qualitative systematic review of patient, carer and professional perspectives. *BMJ Open.* 2017;7:e016832-2017-016832.
6. Christensen EF, Larsen TM, Jensen FB, Bendtsen MD, Hansen PA, Johnsen SP, Christiansen CF. Diagnosis and mortality in prehospital emergency patients transported to hospital: a population-based and registry-based cohort study. *BMJ Open.* 2016;6:e011558-2016-011558.
7. Lovink MH, van Vught AJAH, Persoon A, Koopmans RTCM, Laurant MGH, Schoonhoven L. Skill mix change between physicians, nurse practitioners, physician assistants, and nurses in nursing homes: A qualitative study. *NursHealth Sci.* 2019;21:282–90.
8. Horrocks S, Anderson E, Salisbury C. **Systematic review of whether nurse practitioners working in primary care can provide equivalent care to doctors**.*BMJ* 2002, 324:819–823.
9. Laurant M, van der Biezen M, Wijers N, Watananirun K, Kontopantelis E, van Vught AJ. Nurses as substitutes for doctors in primary care. *Cochrane Database SystRev.* 2018;7:CD001271.

10. Martin-Misener R, Harbman P, Donald F, Reid K, Kilpatrick K, Carter N, Bryant-Lukosius D, Kaasalainen S, Marshall DA, Charbonneau-Smith R, DiCenso A. Cost-effectiveness of nurse practitioners in primary and specialised ambulatory care: systematic review. *BMJ Open*. 2015;5:e007167-2014-007167.
11. Jennings N, Clifford S, Fox AR, O'Connell J, Gardner G. The impact of nurse practitioner services on cost, quality of care, satisfaction and waiting times in the emergency department: a systematic review. *IntJNursStud*. 2015;52:421–35.
12. Woo BFY, Lee JXY, Tam WWS: **The impact of the advanced practice nursing role on quality of care, clinical outcomes, patient satisfaction, and cost in the emergency and critical care settings: a systematic review.** *Hum.Resour.Health*. 2017, **15**:63-017-0237-9.
13. Bouma M. NHG-standaard M05 Urineweginfecties. Utrecht: Nederlands Huisartsen Genootschap; 2020.
14. Heegaard W, Hildebrandt D, Spear D, Chason K, Nelson B, Ho J. Prehospital ultrasound by paramedics: results of field trial. *AcadEmergMed*. 2010;17:624–30.
15. Booth KL, Reed MJ, Brady S, Cranfield KR, Kishen R, Letham K, McAlpine G, Murray DB, Wilson EB, Wilson M, Short S, Clegg GR. Training paramedics in focussed echo in life support. *EurJEmergMed*. 2015;22:430–5.
16. Bhat SR, Johnson DA, Pierog JE, Zaia BE, Williams SR, Gharahbaghian L. Prehospital Evaluation of Effusion, Pneumothorax, and Standstill (PEEPS): Point-of-care Ultrasound in Emergency Medical Services. *WestJEmergMed*. 2015;16:503–9.
17. Reynolds JC, Issa MS, Nicholson C, Drennan T, Berg IR, O'Neil KM, Welsford BJ. M, Advanced Life Support Task Force of the International Liaison Committee on Resuscitation: **Prognostication with point-of-care echocardiography during cardiac arrest: A systematic review.** *Resuscitation* 2020, 152:56–68.
18. NHG Werkgroep slechthorendheid. **NHG-standaard M61: Slechthorendheid.**2014.
19. Rooijackers-Lemmes E, Van Balen FAM, Opstelten W, Wiersma TJ. **NHG-Standaard M49 Otitis Externa.**2014.
20. Venekamp R, Damoiseaux R, Schoch A, Gravenhorst F, Eekhof J, Burgers J, Bouma M, Wittenberg J. **NHG-standaard M18: Otitis Media met effusie bij kinderen.**2014.
21. Nederlandse Vereniging voor Anesthesiologie en Nederlandse Vereniging voor Kindergeneeskunde:. Richtlijn sedatie en/of analgesie (PSA) op locaties buiten de operatiekamer. Utrecht: Nederlandse Vereniging voor Anesthesiologie en Nederlandse Vereniging voor Kindergeneeskunde; 2009.
22. Nederlandse Vereniging van Spoedeisende Hulp Artsen (NVSHA). *NVSHA richtlijn Procedurele Sedatie en Analgesie door SEH-artsen op de Spoed Eisende Hulp*. Utrecht: https://www.nvsha.nl/files/33/NVSHA_Richtlijn_PSA_versie_2.0.pdf; 2016.
23. Wichers IM, Bouma M. NHG Behandelrichtlijn Traumatische wonden en bijtewonden. Utrecht: Nederlands Huisartsen Genootschap; 2017.
24. Lockey DJ, Lyon RM, Davies GE. **Development of a simple algorithm to guide the effective management of traumatic cardiac arrest.** *Resuscitation* 2013, 84:738–742.
25. Peters J, Ketelaars R, van Wageningen B, Biert J, Hoogerwerf N. Prehospital thoracostomy in patients with traumatic circulatory arrest: results from a physician-staffed Helicopter Emergency Medical Service. *EurJEmergMed*. 2017;24:96–100.
26. Jodie P, Kerstin H. BET1: Pre-hospital finger thoracostomy in patients with traumatic cardiac arrest. *EmergMedJ*. 2017;34:417–8.

27. WHO Library. Cataloguing-in-Publication Data. **International statistical classification of diseases and related health problems. – 10th revision, edition 2010.** 2011.
28. Van de Ven D, Bos N, De Boer D. **Kwaliteit van ambulancezorg vanuit het perspectief van cliënten: ervaringen van cliënten met de ambulancezorg gemeten met de CQ-indexen planbare en spoedeisende ambulancezorg.**2017.

Table

Table 1
– Addition diagnostic and therapeutic interventions performed by the NP

Domain	Intervention	Indication	Description of intervention	Evidence-based
Diagnostic	Urinalysis	<ul style="list-style-type: none"> • Suspected urinary tract infections • Suspected kidney calculi • Trauma • Fever • Undefined abdominal complaints 	Urinalysis dipsticks contain discrete reagent pads to semi-quantitatively test for the presence of bilirubin, blood, creatinine, glucose, ketones, leukocytes, nitrite, pH, protein in a urine sample. This tests may be read visually by comparing the colors that develop on each reagent pad to a chart provided by the strip manufacturer.	<p>1 guideline of the Dutch College of General Practitioners [13]:</p> <ul style="list-style-type: none"> • Guideline 'Urinary tract infections'
	Ultrasound	<ul style="list-style-type: none"> • Abdominal trauma • Thoracic trauma • Out-of-hospital cardiac arrest • Fascia iliac compartment block • Intravenous cannula placement • Intubation check • Collapse • abdominal pains • Non-traumatic thoracic complaints. 	Use of Point Of Care Ultrasound(POCUS) to determine short clinical questions and support diagnostic or/and treatment process. POCUS to triage hospital-level in prehospital setting.	4 studies [14–17]

Domain	Intervention	Indication	Description of intervention	Evidence-based
	Otoscope	<ul style="list-style-type: none"> • Suspected pathology of the outer ear canal and tympanic membrane, e.g. pain, trauma, • (Suspected) corpus alienum • Loss of hearing 	With a hand-held medical device it's possible to make an inspection of the ear to screen for illness. An otoscope potentially gives a view of the ear canal and tympanic membrane or eardrum. Because the eardrum is the border separating the external ear canal from the middle ear, its characteristics can be indicative of various diseases of the middle ear space.	<p>3 guidelines of the Dutch College of General Practitioners [18–20]</p> <ul style="list-style-type: none"> • Guideline 'Otitis Externa' • Guideline 'pediatric otitis media with effusion' • Guideline 'hearing impairment'
Therapeutic	Procedural sedation and analgesia (PSA)	<ul style="list-style-type: none"> • Joint or fracture reposition • Agitation • Post out-of-hospital cardiac arrest 	PSA means the administration of a sedative and / or (sedative) analgesic in the context of a painful, stressful and / or immobility-demanding diagnostic or therapeutic procedure with the aim of making this procedure as comfortable as possible for the patient and thereby contribute to optimal diagnostic or therapeutic conditions.	<p>2 national guidelines [21, 22]:</p> <ul style="list-style-type: none"> • Guideline 'sedation and/or analgesia (PSA) outside the operation room' of the Dutch Society of Anesthesiology and the Dutch Society of Pediatrics • Guideline 'procedural sedation and analgesia (PSA) by emergency physicians at the emergency department' of the Dutch society of Emergency Physicians

Domain	Intervention	Indication	Description of intervention	Evidence-based
	Surgical wound closure	<p>Surgical skin glue:</p> <ul style="list-style-type: none"> • Superficial, clean, non-gaping wound existing less than 12 hours <p>Stitching:</p> <ul style="list-style-type: none"> • Clean, uninfected wound, caused by a sharp and clean object, with little or no bruising of the surrounding skin, sharp wound edges that can be placed together with little tension. Treatment within 12–18 hours after injury, wounds to the head or neck within 24 hours. • Bite wounds and other contaminated wounds (but not infected wounds) that can be properly disinfected and cleaned within 12 hours <p>Contraindications:</p> <ul style="list-style-type: none"> • Tendon injury, underlying fracture, nerve injury, (arterial) vascular injury and joint capsule injury • Wounds with a longer duration than the indications described above 	<p>In the primary intention method, surgical wound closure facilitates the biological event of healing by joining the wound edges by using “surgical glue” or stitches. Surgical wound closure directly opposes the tissue layers, which serves to minimize new tissue formation within the wound.</p>	<p>1 guideline [23]:</p> <ul style="list-style-type: none"> • Guideline ‘Traumatic and bite wounds’ of the Dutch College of General Practitioners

Domain	Intervention	Indication	Description of intervention	Evidence-based
	Drug prescription	<p>Concerning medication prescribed:</p> <ul style="list-style-type: none"> - they are within the area of expertise of the NP; - they are of limited complexity; - routinely prescribed; - they are of manageable risk; - and are prescribed in accordance with national guidelines, standards and protocols derived thereof. 	by writing a prescription medication is prescribed	<ul style="list-style-type: none"> • All guidelines of the Dutch College of General Practitioners <p>https://richtlijnen.nhg.org/#tab-nhgstandaarden</p>
	Thoracostomy	<ul style="list-style-type: none"> • Tension pneumothorax • Hemothorax • HOTT-procedure during traumatic cardiac arrest 	Instrument/Finger Thoracostomy is a procedure in which an incision is made into the chest wall and pleural cavity to drain air or fluid.	<ul style="list-style-type: none"> • 3 studies [24–26]

Table 2
– Outcomes and data sources

Outcome	Data source(s)	Data-analysis
<i>Patient and ambulance run characteristics</i>		
Demographic data (age, sex, geographical location)	EMS dispatch database EMS run sheet	- Descriptive - Comparison between NP group and regular care group
Process data (Time, dispatch urgencies, routes)		
Medical data (Initial dispatch complaints, on-scene diagnosis, vital functions, diagnostic and therapeutic interventions)		
<i>Patient safety</i>		
The number of complaints The number of major/minor incidents	EMS quality management database	- Descriptive
Follow-up care within 24 h, 48 h or 72 h after non-conveyance, categorized into emergency follow-up care (ambulance, ED and GP out-of-hours office) or regular care (GP, other)	Telephone questionnaire	- Descriptive - Comparison between NP group and regular care group
The degree of guideline adherence for each additional intervention	Powerapps	- Descriptive
<i>Patient experience</i>		
Handling, treatment, communication	Telephone questionnaire	- Descriptive - Comparison between NP group and regular care group