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2024 er næsten gået og julemåneden er i fuld gang.

Det har været et spændende år, som blandt andet har budt på en ny sundhedsreform, som vil styrke sundhedsvæsenet og rykke det tættere på borgerne. Regeringen vil med reformen styrke og ruste sundhedsvæsenet til fremtiden med blandt andet en reduktion af regionerne fra fem til fire samt etablering af nye lokale sundhedsråd. Med egen økonomi og beslutningskompetence skal sundhedsrådene udbygge det nære sundhedsvæsen og sikre sammenhæng mellem behandlingen på sygehusene og udenfor. Hvad dette har af betydning for det akutte område, bliver spændende at følge de næste år.

Flere er allerede i gang med den transformation, som den nye sundhedsreform kalder på. Der er blandt andet etableret et tværsektorielt forskningscenter, som vil fokusere på patientforløb, der går på tværs og som fx inkluderer en akut indlæggelse. En nyligt afholdt netværkskonference i Aarhus omhandlede behandling af akut somatisk syge patienter i det nære sundhedsvæsen. Konferencen viste flere eksempler på, hvordan forskellige akutafdelinger rundt om i Danmark i samarbejde med almen praksis, kommuner og præhospital rykker behandlingen tættere på borgeren. Oplæggene viste, at der er mange måder, hvorpå akutafdelingerne kan være med til at sikre, at flere patienter behandles i eget hjem eller på plejecentre. Det kan fx være hospital-at-home, udekørende funktioner, fasttrack spor, og 'watchful waiting' i forhold til indlæggelse. Det er derfor oplagt at dele sin viden på tværs – og vi i redaktionen for Dansk Tidsskrift for Akutmedicin vil gerne opfordre til, at man deler sin viden eksempelvis igennem tidsskriftet.

Det er der flere, som allerede har gjort. Et eksempel på, hvordan sygehus, almen praksis og kommune sammen kan optimere forløbet omkring den akutte syge ældre patient har *Friesgaard et al.* beskrevet i deres artikel i dette nummer. De kom frem til at uddelegering af point-of-care-test til kommunale sygeplejersker reducerede antallet af akutte indlæggelser.

Dette nummer byder også på, hvilken effekt en sygeplejefaglig kompetenceudvikling i krisehåndtering kan have for pårørendes oplevelser (*Blaabjerg et al.*), hvordan ultralyd kan bruges i akutafdelingen (*Arvig et al.*), hvordan biomarkøren S100B bruges ved hovedtraume (Jensen et al.), en protokol til et systematisk review, der vil se på sammenhængen mellem serielle målinger af hjerte-ultralydsparametre og prognose (*Arvig et al.*), samt en kasuistik om hypotermi udløst ventrikulær takykardi (*Sjøholm-Christensen et al.*) og om popliteaaneurisme (*Posth et al.*).

Vi håber I vil finde det nye nummer interessant.

Glædelig Jul fra Redaktionen

Dansk Tidsskrift for Akutmedicin

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Danske resumeer af originalartikler

Hvordan påvirker en sygeplejefaglig kompetenceudvikling pårørendes oplevelser i to danske traumecentre? En tidsserieanalyse

Baggrund

I 2021 havde danske akutmodtagelser knap 1,8 millioner kontakter med akut, kritisk syge eller tilskadekomne patienter. Når patienten ledsages af sine pårørende, har sygeplejersken opgaver relateret til både patient og pårørende, herunder at støtte pårørende til at takle situationen. Dog oplever sygeplejersker ofte, at de mangler kompetencer til at møde kriseramte pårørende. Formålet med dette studie var derfor at undersøge, hvilken effekt en sygeplejefaglig kompetenceudvikling i krisehåndtering kan have for pårørendes oplevelser.

Metode – Design, setting og data

Studiet var designet som et prospektivt interventionsstudie baseret på Interrupted Time Series analyser og blev gennemført i Traumecentret på henholdsvis Aarhus og Aalborg Universitetshospital i 2020-2021. Deltagerne var pårørende (18+ år) til kritisk syge eller tilskadekomne patienter samt pårørende til patienter, der uventet døde i Traumecentret, eller blev indbragt døde til afdelingen (n=293).

Interventionen fokuserede på sygeplejerskens kompetencer til at håndtere pårørende i krise og bestod af undervisning i kriseteori, viden om behov og reaktioner samt håndtering af kriseramte igennem praksisorienterede øvelser. Undervisningen blev gennemført af en krisepsykolog som halvdagsworkshops for alle sygeplejersker. For at understøtte interventionen udviklede vi et lommekort, der beskrev håndtering af pårørende 1) ved ankomst, 2) under forløbet i traumecentret 3) ved afsked.

Et nyudviklet spørgeskema med 32 spørgsmål blev anvendt til indsamling af data om deltagernes karakteristika og om deres oplevelse af information, inddragelse og støtte. Data blev analyseret i tre tidsperioder: før-periode (6 måneder), implementeringsperiode (3 måneder) og efter-periode (6 måneder). Det primære outcome var den pårørendes samlede kvalitetsoplevelse målt på en VAS (0-10). Ændringerne i de sekundære outcome information, inddragelse og støtte blev målt med marginscores og risikoratio (RR) og blev både målt som vægtede og ikke-vægtede scores.

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Blaabjerg et al.: Hvordan påvirker en sygeplejefaglig kompetenceudvikling pårørendes oplevelser i to danske traumecentre? En tidsserieanalyse.
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I de vægtede scores blev vigtigheden af udsagnet medregnet. Grundet ceiling effekt blev både primære og de sekundære outcomes dikotomiseret, og cut-off niveauer baseret på histogramdata.

Resultater

Samlet set blev der ikke observeret forskelle mellem deltagernes karakteristika i de tre perioder. 57,3% af de pårørende var over 50 år, og 70% af alle pårørende var kvinder. Næsten halvdelen af alle de pårørende var patientens ægtefælle/samlever, mens omkring 47% enten var forældre eller søn/datter til patienten. 62,5% af de pårørende kom fra Aarhus Universitetshospital, mens 37,5% kom fra Aalborg Universitetshospital. De pårørendes oplevelse af sygeplejerskernes krisehåndtering lå i den øverste kvartil af skalaen i alle tre perioder, både målt på median og ved dikotomisering >8 og <=8.

Hvad ved vi?

- Sygeplejersker, der arbejder i traumecentre, ser ud til at mangle viden om pårørendes behov, og føler sig ikke altid kompetente til at yde sygepleje til pårørende.

Hvad tilføjer denne artikel til vores viden?

- Kompetenceudvikling for sygeplejersker med fokus på krisehåndtering ser ud til at have en positiv effekt på de pårørendes oplevelser – med signifikant effekt på oplevelsen af sygeplejerskens inddragelse.

Sammenligning af data mellem alle tre perioder viste ingen signifikant udvikling, mens sammenligning af implementerings- og efterperioden viste en signifikant positiv forskel i de pårørendes vurdering af krisehåndteringen [p=0,009]. Derudover steg sandsynligheden for at score >8 (VAS) fra før til efter interventionen signifikant [RR 1,21, 95% CI 1,16-1,27]. Analyserne af de sekundære outcomes viste, at den største udvikling over tid var inddragelse af pårørende, [RR, 1,25 95% CI 1,15-1,35]. Information havde størst effekt på pårørendes oplevelse af sygeplejerskers krisehåndtering RR på 2.15 (95% CI 1.78-2.60), og var samtidig det behovsområde, som pårørende anså for vigtigst. Information var det behovsområde, der udviklede sig mindst.

Konklusion og perspektivering

Baseret på de udvalgte cut-off niveauer indikerede fundene i dette studie en positiv effekt på pårørendes oplevelser – særligt inddragelse af pårørende. *Information* var det behov, de pårørende anså for vigtigst – og det behov, der havde størst effekt på deres samlede oplevelse, hvilket er i overensstemmelse med andre studiers fund. Nærværende studie bidrager med ny evidens om betydningen af sygeplejerskers kompetencer til krisehåndtering og bør derfor prioriteres i traumecentre og akutmodtagelser (1). I tråd hermed findes der i litteraturen gentagne anbefalinger om, at sygeplejerskers kommunikative og emotionelle kompetencer bør styrkes (2-4).

Hvad tilføjer denne artikel til vores viden?

- Fremtidige interventioner bør fokusere mere på at træne sygeplejersker i at give information til pårørende, da information var det behovsområde som pårørende vurderede som mest vigtigt, og som også havde størst effekt på deres samlede oplevelse af krisehåndteringen. Dog var information også det behovsområde, der udviklede sig mindst i løbet af undersøgelsen.

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Original-, udviklings-, og kvalitets artikler

Point-of-care ultrasound in emergency medicine: A position paper by the Danish Emergency Medicine Ultrasound Committee

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Abstract

Since the first recommendations for the use of point-of-care ultrasound in emergency departments in Denmark were published in 2014, emergency medicine was established as an independent specialty in 2017, and continuing development and research within the ultrasound field have created a need for updating the existing consensus paper.

The purpose of this position paper by the Danish Emergency Medicine Ultrasound Committee is to describe the ultrasound protocols, education, organization, medico-legal issues, and research in point-of-care ultrasound in the emergency medicine specialty in Denmark.

Keywords:

Point-of-care ultrasound; PoCUS, emergency medicine; emergency department

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Introduction

Point-of-care ultrasound (PoCUS) has become essential in Danish emergency medicine (EM), improving clinical practice through improved diagnostics, procedures, and patient outcomes (1).

Emergency Departments (EDs) were established as a governmental act in Denmark in 2007 (2). However, EM was not an individual specialty then, and physicians from various related specialties staffed the EDs as a part of their employment (3). Concurrently, the first PoCUS courses were held, but participation was not mandatory for physicians working in the ED. In 2014, the first recommendations for POCUS use were published, preceding the formal recognition of EM as an independent specialty in Denmark in 2017 (4). While many initial goals for PoCUS have been achieved, ongoing advancements in the clinical application and organizational frameworks necessitate revised recommendations.

This position paper by the Danish Emergency Medicine Ultrasound Committee outlines the current recommendations for POCUS protocols, education, organization, medico-legal issues, and research in EM PoCUS in Denmark.

Hvad ved vi?

- Point-of-care ultralyd (PoCUS) er en obligatorisk del af speciallægeuddannelsen i akutmedicin gennem teoretisk og praktisk kursus, superviserede skanninger og certificering.

The writing and recommendation panel

The recommendations panel comprises members of the Danish Emergency Medicine Ultrasound Committee and physicians from related specialties (the author group of this article), including respiratory medicine, geriatrics, and cardiology, who possess expertise in ultrasound. The final recommendations reflect a consensus view, integrating the current evidence for PoCUS in EM settings.

The scope of practice

In this position statement, PoCUS is defined as an ultrasound investigation conducted and interpreted at the bedside in the clinical context, whereas focused PoCUS is a further abridged examination where simple dichotomous, clinically relevant yes/no questions are answered. As an expansion, PoCUS in EM in Denmark is now divided into level 1 (basic), an obligate part of the residency in EM, and level 2 (advanced), an optional part of continuing medical education for the specialist in EM. The committee advocates that all ultrasound examinations are performed on proper indication and not as a mandatory add-on to all patient evaluations.

Level 1 PoCUS

Level 1 ultrasound protocols

The ultrasound protocols are founded on evidence-based international guidelines and the panel's expert consensus agreement. The protocols are organ-based, where the ED patient is scanned based on symptoms or other suspected pathology in the relevant organ or structure. The following protocols are used with highlighted clinical yes/no questions (Table 1):

- Focused cardiac ultrasound (FoCUS): Signs of pericardial effusion, reduced left ventricular function, right ventricular dilatation, or abnormal IVC (7,8).
- Focused Abdominal Ultrasound (FAUS): Signs of gall stones, cholecystitis, hydro-nephrosis, abdominal aorta aneurism, urine retention, free fluid, or small bowel obstruction (9–12).

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Table 1. Overview of the level 1 and level 2 ultrasound protocols used in the emergency medicine specialty in Denmark

Ultrasound protocol	Level 1[a]	Level 2[b]
FLUS/LUS	Pneumothorax Lung consolidations Focal or multiple B-lines Pleural effusion	Differentiation between lung consolidations Parietal and visceral pleural thickness and regularity Quantification of pneumothorax Differentiation between different types of pleural effusions
FoCUS/CUS	Pericardial effusion Reduced left ventricular function Right ventricular dilatation Abnormal IVC	Reduced regional wall motion in the left ventricle Severe aortic stenosis Severe aortic regurgitation Severe mitral regurgitation Signs of pulmonary hypertension
FAUS/AUS	Gall stones Cholecystitis Hydronephrosis Abdominal aorta aneurism Urine retention Free fluid Small bowel obstruction	Cholestasis (intra- and extrahepatic) Colitis Diverticulitis Appendicitis Gastroparesis
2-CUS/CDUS	DVT in femoral, popliteal, or proximal lower leg veins Differential diagnoses of DVT	DVT in the whole lower extremity and use of color Doppler
FMSK/MSK	Achilles tendon rupture Free fluid in joints Hematoma Cysts	Fractures in the upper extremities in children up to 12 years, clavicle and rib fractures Shoulder examination with signs of tendon ruptures, inflammation, or impingement
eFAST	Pneumothorax Hemothorax Hemopericardium Hemoperitoneum	NA

2-CUS = 2-region compression ultrasound; AUS = abdominal ultrasound; CUS = cardiac ultrasound; CDUS = complete duplex ultrasound; DVT = deep venous thrombosis; eFAST = extended focused assessment with sonography for trauma; FAUS = focused abdominal ultrasound; FLUS = focused lung ultrasound; FMSK = focused musculoskeletal ultrasound; FoCUS = focused cardiac ultrasound; LUS = lung ultrasound; MSK = musculoskeletal ultrasound; NA = not applicable.
[a] Level 1: The basic level learned as an obligate part of the emergency medicine specialty.
[b] Level 2: The advanced level—an optional education.

Hvad tilføjer denne artikel til vores viden?

- Uddannelsen i PoCUS er evidensbaseret og organisatorisk forankret. PoCUS er opdelt i to niveauer – et obligatorisk basisniveau og et valgfrit avanceret niveau.

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- 2-region compression ultrasound (2-CUS): Signs of deep venous thrombosis (DVT) in the femoral vein, popliteal vein, and the proximal portion of the veins of the calf (13).
- Focused musculoskeletal Ultrasound (FMSK): Signs of Achilles tendon rupture, free fluid in joints, hematoma, and cysts (14,15).

Several whole-body protocols exist where different parts of the organ-based protocols are combined into a systematic examination in specific scenarios. In Denmark, the extended focused assessment with sonography for trauma (eFAST) is used in unstable trauma patients. Otherwise, it is emphasized that the organ-based approach is used with a combination of the different protocols depending on the symptom presentation.

Level 1 ultrasound-guided procedures

Ultrasound should be used in procedures relevant to the ED setting to increase success rates, reduce discomfort, and diminish the risk of complications. The following ultrasound-guided procedures are obligatory in the core curriculum:

- Venous access
- Therapeutic and diagnostic thoracentesis
- Therapeutic and diagnostic abdominal paracentesis
- Suprapubic bladder puncture and placement of bladder catheter

The use of ultrasound is not limited to the abovementioned procedures and could be expanded when appropriate, e.g., in arterial, joint, and lumbar punctures.

Education, clinical training, and certification in level 1 PoCUS

Figure 1 provides an overview of the educational program, consisting of theoretical e-learning, a practical course, supervision, certification, continuing education, and clinical use.

Theoretical e-learning

The educational program begins with a theoretical e-learning module. This module concludes with a self-test, but no formal passing is a prerequisite as trainees' competencies are evaluated in a final exam. However, the course content is expected to be mastered before the course; otherwise, it will be difficult for the ultrasound trainee to complete the practical course with sufficient yield.

Procedural ultrasound is learned through the same e-learning module as the ultrasound protocols.

Practical training course

In the two-day hands-on training, the trainees will learn the practical scanning techniques of all the ultrasound protocols. No formal lessons are held. On the first day, the trainees will scan healthy subjects in all the areas. One instructor is dedicated to two trainees to enhance trainee-instructor interaction and supervision. In the last part of the first day, the trainees repeat all the protocols combined with scenario training with pathological findings. On the second day, the trainees apply their acquired scanning skills to ED patients, and all the protocols are practiced again.

Supervision

After the course, the trainees return to their departments to qualify for the final exam. A local ultrasound mentor

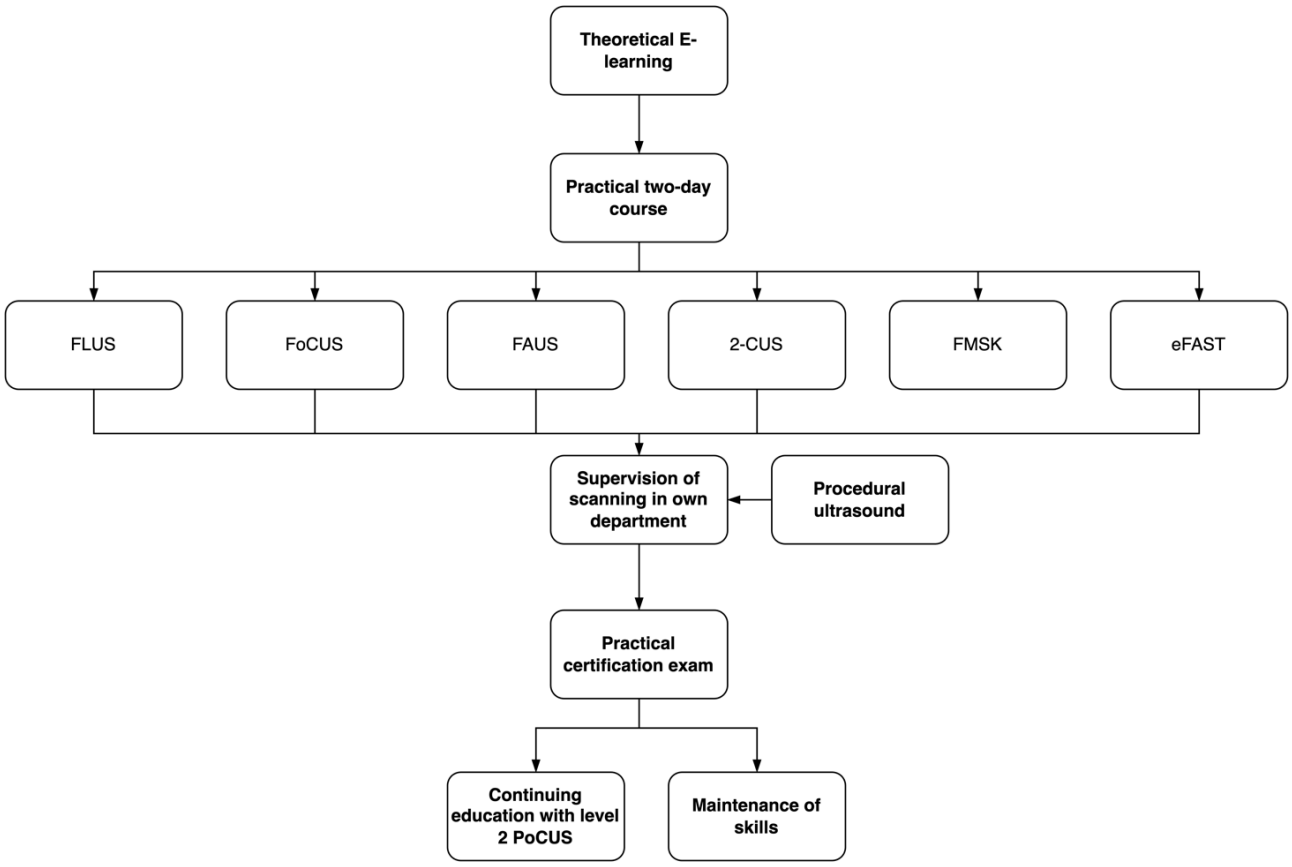
is appointed to ensure the trainees receive supervision while scanning patients in all areas. The local mentor should be certified in PoCUS at the basic level, have used it in daily practice, and preferably be credentialed as a specialist in EM to provide the integrated clinical approach to the ED patient with PoCUS. No evidence exists regarding a specific threshold of scans required to reach an adequate level of competency, but the panel recommends 25 supervised scans in each protocol, also acknowledging that the learning curve may level out above or below depending on the individual abilities of the trainee and the local mentor's endorsement. Upon completing all the scans, the trainee is nominated by the mentor for the final certification.

Competencies in procedural ultrasound should be integrated during the same supervision period, and the trainee should complete five supervised and successful procedures in the four obligatory fields.

Certification

The certification consists of a practical exam in which the trainee scans all areas on a healthy subject, complemented by theoretical questions and interpretation of ultrasound clips. An approved PoCUS instructor evaluates

Figure 1. Overview of the educational program in PoCUS in the emergency specialty in Denmark.



2-CUS = 2-region compression ultrasound; eFAST = extended focused assessment with sonography for trauma; FAUS = focused abdominal ultrasound; FMSK = focused musculoskeletal ultrasound; FoCUS = focused cardiac ultrasound; FLUS = focused lung ultrasound; PoCUS = point-of-care ultrasound.

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the trainees' competencies using the Objective Structured Assessment of Ultrasound Skills (OSAUS) rating scale (16). Competences in the procedures are evaluated using phantoms/simulators. Certification is a criterion for obtaining the EM specialty.

Level 2 PoCUS

As part of continuing education, the EM physician credentialed in the basic course can advance to level 2 PoCUS in some or all ultrasound fields. Level 2 ultrasound protocols are built as superstructures of basic protocols with a more diagnostic focus. The level 2 syllabus lies in the field between the focused PoCUS and a diagnostic ultrasound, where all possible pathological conditions in an organ or structure are detected. Therefore, the level 2 PoCUS will have overlaps with ultrasound performed by other specialties, especially cardiology, respiratory medicine, and radiology. Consequently, the committee recommends formal meetings with the societies from the respective specialties to formulate consensus statements. However, EM physicians must recognize that many ultrasound findings require further diagnostic evaluation, either acute or at an outpatient clinic. The level 2 protocols include but are not limited to the following modalities (Table 1):

- *Lung ultrasound (LUS) level 2*: Differentiation between types of lung consolidations, parietal and visceral pleural thickness and regularity, quantification of the size of pneumothorax, and differentiation between types of pleural effusions (5,6).
- *Cardiac ultrasound (CUS) level 2*: Signs of reduced regional wall motion in the left ventricle, severe aortic stenosis, severe aortic regurgitation, severe mitral regurgitation, and signs of pulmonary hypertension (7).
- *Abdominal ultrasound (AUS) level 2*: Signs of cholestasis, colitis, diverticulitis, appendicitis, and gastroparesis (17,18).
- *Complete duplex ultrasound (CDUS)*: Signs of DVT in the whole lower extremity and the use of color Doppler of the common femoral and popliteal vein (13).
- *Musculoskeletal ultrasound (MSK) level 2*: Signs of fractures in the upper extremities in children up to 12 years, clavicle and rib fractures, shoulder examination with signs of tendon ruptures, inflammation, or impingement (14,15,19).

The teaching of the level 2 ultrasound protocols is provided through optional courses with experts within the field. The subsequent training takes place in one's department, which should have agreements for supervision from relevant specialties. Certification is the goal in the future.

Organization

Structure

The organizational structure of the application of PoCUS in EM is grounded within the Danish Society of Emergency Medicine (DASEM), where an appointed committee is an executive board with a chairman and dedicated volunteers with an emphasis on inclusivity and diversity. Final decisions are centralized. We recommend that every ED appoints an ultrasound director with educational, quality, research, technical, and medical-legal responsibilities. In addition, the ultrasound director should lead organizational structures to implement and improve

quality for the aforementioned areas. In addition, the EDs should have local mentors supervising the trainees to reach sufficient competencies and final approval for the trainees' eligibility for the final exam.

Tasks

The committee's tasks cover the following areas:

- *Advisory*: Advising DASEM regarding the society's current position related to the use, education, certification, and maintenance of PoCUS skills.
- *Cooperative*: Cooperates with the Danish Ultrasound Diagnostic Society (DUDS) and the Danish Society for Ultrasound in general practice and committees on ultrasound grounded within different specialties' societies as well as international societies—the European Federation of Societies for Ultrasound in Medicine and Biology (EFSUMB), The ultrasound section of the European Society for Emergency Medicine (EUSEM), and World Interactive Network Focused On Critical UltraSound (WINFOCUS).
- *Educational*: Design of the educational program in close cooperation with the DASEMs education committee and responsibility for coordinating and holding courses in the core curriculum and masterclasses in level 2 PoCUS, the later in collaboration with the Acute Ultrasound Academy (AKULA) at Odense University Hospital.
- *Guidelines*: Development of PoCUS guidelines and guidelines for course instructors.
- *Research*: The committee offers counseling, help with networking, coordination, ideas, and patient inclusion in PoCUS-related trials. It collaborates with the research network, the Ultrasound research network (UFO) at Aarhus University Hospital, AKULA, and the Research Entity for Studies in Clinical aCUte Medicine (RESCUE) at Slagelse Hospital.

Medico-legal issues

The legislative framework for ultrasound documentation involving the emergency setting is embedded in the Ministerial Act on Documentation in Health Records (20). The following is not an exhaustive list, but the minimum requirements for documentation:

- PoCUS protocol
- Indication
- Technique and procedural description
- Findings
- Interpretation

All ultrasound examinations must be documented in the medical record (20). While there are no formal legal requirements for storing ultrasound images and clips, the committee strongly recommends and encourages that all PoCUS investigations be stored, provided it does not cause delays in critical care. Storage has several advantages: protection against malpractice claims, avoiding unnecessary interventions, educational purposes, audit of the quality of images/clips, and consultative purposes with other specialties.

Hvad tilføjer denne artikel til vores viden?

Understøtte brugen af PoCUS og muligvis nedsætte brugen af radiologisk udført ultralyd, tilsyn mhp. ekkokardiografi samt brugen af CT-abdomen.

Research

The Danish Emergency Medicine Ultrasound Committee seeks to promote and engage in various PoCUS-related research activities. Several members are actively occupied in PoCUS research, in practical issues like including patients, facilitating contact with relevant clinicians and/or researchers in related specialties, and as principal investigators in ongoing PoCUS projects. The committee aims to enhance multicenter ultrasound studies across Denmark and internationally. The research focus is not constrained to specific areas, but an overarching goal is to conduct ultrasound research applicable to an emergency setting logistically. The ongoing projects are collected on a webpage as a framework for inspiration, collaboration, and participation.

Conclusion

The Danish Emergency Medicine Ultrasound Committee sets standards for PoCUS use in emergency settings. It outlines mandatory structured education and skill advancement. Their framework promotes inter-specialty collaboration and research, enhancing patient care and clinical outcomes.

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Original-, udviklings-, og kvalitets artikler

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Usage of biomarker S100B to avoid CT after low-risk, mild head trauma: a single center clinical review of the Scandinavian head trauma guideline and guideline adherence

Abstract

Background

In 2013, the Scandinavian Neurotrauma Committee (SNC) published a new guideline for managing minimal, mild, and moderate head trauma. The SNC guideline included using biomarker S100B to identify patients needing a head computed tomography (CT).

Purpose: To explore the use of S100B and guideline adherence in relation to the SNC guideline

Methods

In this retrospective cohort study, data was collected for all consecutive S100B blood samples drawn in a Danish Emergency Department between March 1, 2022 and March 1, 2023. Patient data was extracted from "EPJ Syd". Patient records were screened to determine the head trauma category based on patient history, physical examination, and symptoms.

Results

A total of 236 patient cases were included and categorized according to SNC head trauma categories. Guideline adherence was achieved for 152 patient cases (64.4%). Non-adherence (35.6%) was mainly seen in the minimal and low-risk, mild head trauma categories. The reasons for non-adherence were excessive S100B blood sampling, late blood sampling, and missing and excessive head CTs.

Conclusion

Guideline adherence was generally challenged, and non-adherence was a substantial part of the results. Further studies are needed to explore reasons for non-adherence and possible solutions for improving guideline adherence.

Abbreviations: Emergency Department (ED), Computed Tomography (CT), Scandinavian Neurotrauma Committee (SNC), Negative Predictive Value (NPV), Interquartile Ranges (IQR), Glasgow Coma Scale (GSC)

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Introduction

The majority (85%) of all head injuries are classified as mild head traumas, and annually, an estimated 20,000 patients are diagnosed with a mild head injury in Danish Emergency Departments (EDs) (1).

Computed tomography (CT) is often used to diagnose intracranial injuries in patients with head trauma, which has caused an increase in the use of head CTs (2). In Denmark, there has been a general increase in CT scans, including head CTs, over the past decades, with the overall number increasing from 230,000 to 990,000 from 2003 to 2017 (3).

In 2013, the Scandinavian Neurotrauma Committee (SNC) published a new guideline (SNC guideline) for managing head trauma, including the biomarker S100B (4). The SNC guideline's purpose was to diagnose patients needing neurosurgical or medical intervention and identify possible brain lesions. As a secondary purpose, the biomarker S100B was introduced (4). The biomarker is elevated in patients with intracranial injuries and, therefore, used to rule out the need for a head CT. S100B is a brain injury biomarker with a high sensitivity of 97% and a high negative predictive value (NPV) of 99% (5).

The SNC guideline identifies head trauma categories based on the severity of trauma. The categories are minimal, mild, and moderate, with the mild category subdivided into three subcategories based on risk factors (Fig. 1). According to the SNC guideline, S100B only applies to the low-risk, mild head trauma category (4). Recently, the use of S100B in a more diverse population of patients has been discussed (6).

Studies exploring guideline adherence revealed a lower adherence to the minimal and mild head trauma categories compared to the other head trauma categories, often resulting in unnecessary CT scans and longer admission times (7, 8).

To our knowledge, no studies have investigated guideline adherence based solely on consecutive S100B blood sample data. Therefore, this study aimed to explore the use of S100B and guideline adherence in relation to the SNC guideline. Our objective was to estimate the clinical use of S100B blood samples regarding the treatment of the correlating head trauma in a Danish ED.

Materials and methods

Study design and setting

This retrospective, single-center cohort study included head trauma patients admitted to a Danish ED at a University Hospital. The ED had an intake of roughly 66,000 patients in 2022 (10).

This study was reported according to the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) guideline (11).

Patient selection and data collection

All included patients were 18 years old or above with head trauma and a correlating S100B blood sample. Head trauma was defined as any kind of blunt head trauma. All patients meeting these criteria were included consecutively between March 1, 2022, and March 1, 2023. All data collection was conducted in April 2023.

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A list of serum S100B samples was obtained through the Department of Clinical Biochemistry. This only included patients with S100B blood samples from the ED and all other departments. This included a majority of blood samples for monitoring severe cerebral injury from the Neurological Intensive Care Unit. All blood samples drawn from departments other than the ED and for purposes other than head trauma were excluded from this study. The concentration (μg/L), date, and time of the S100B blood samples were extracted for all remaining patients. Patient data, including age, gender, use of blood thinners, Glasgow Coma Scale (GCS), cause of injury, time of trauma and blood sampling, and whether a head CT was performed, were extracted from the Danish patient record system called "EPJ Syd." Patients with incomplete records or patients who left against medical advice were excluded (Fig. 2). Incomplete records were defined as records in which any of the patient data listed above were missing.

A codebook was constructed between the two primary investigators with instructions for data collection to ensure high-quality data and a systematic approach to screening patient records. In case of ambiguity regarding patient records, the two primary investigators conferred these cases and came to an agreement. Data was stored in a secure SharePoint platform that was only accessible to the authors of this article.

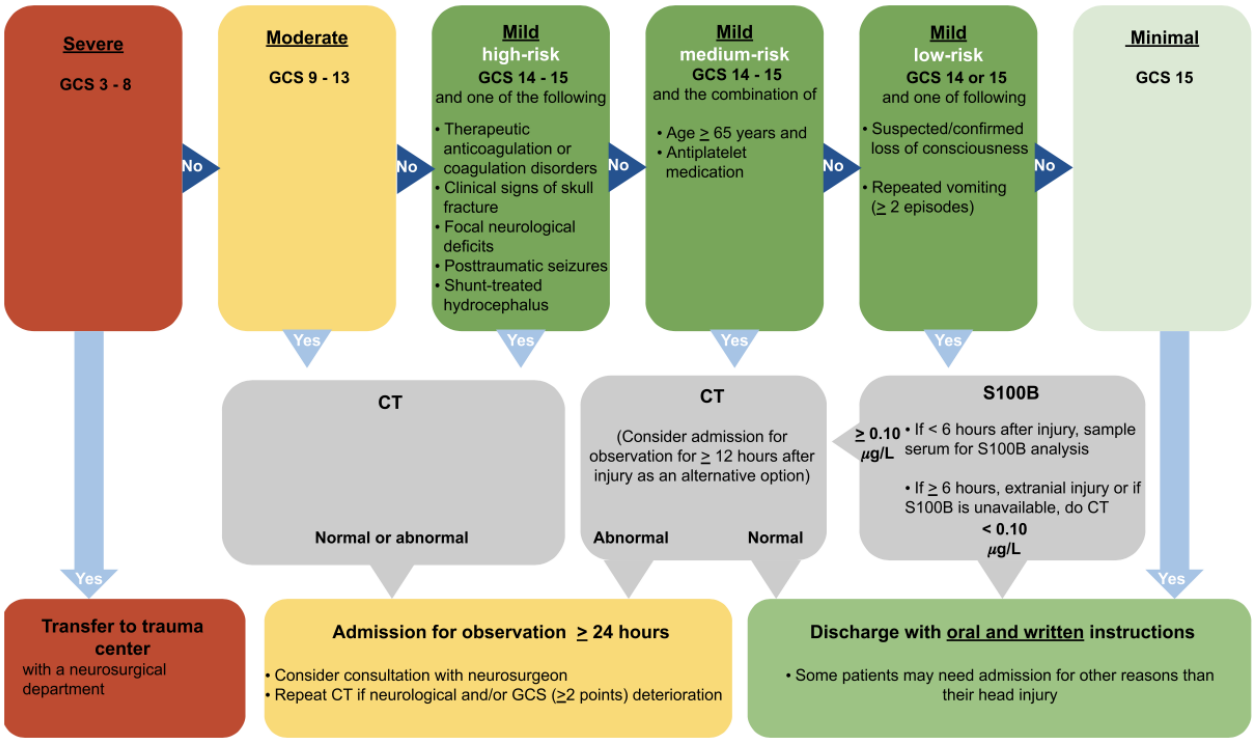
Variables of interest

The primary outcome variable was guideline adherence (yes/no) based on head trauma category, S100B blood sampling, and head CT evaluation.

Head trauma categories

Patient records were screened for the different head trauma categories according to the modified SNC flowchart used in the ED (Fig. 1).

Figure 1. The SNC guideline as used in the Danish ED. This version has been modified from the original SNC flowchart to include instructions for severe head trauma (9). Translated from Danish to English by the two primary investigators.



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Patient history, physical examination, and symptoms were combined in the assessment of the head trauma category. Causes of head trauma were categorized as incidental falls, traffic accidents, violent assaults, and others. If patients were treated for a new head trauma with ≥72 hours between each incident, they were defined as two individual patients. The included patients are referred to as patient cases.

S100B blood sampling and assay

According to the SNC guideline, blood sampling should occur within six hours from the time of head trauma. Therefore, the head trauma and blood sampling times were noted and then subtracted to calculate the time in between. If the blood sample was drawn ≥6 hours after the trauma, it was registered as late blood sampling. The time of head trauma was defined as the time noted by the ED staff or the paramedics in the patient records.

Serum S100B analysis was performed on Cobas e801 instruments (Roche Diagnostics®, Mannheim, Germany) using Roche reagents.

Hvad ved vi?

- SNCs guideline fra 2013 bliver brugt i danske akutmodtagelser til kategorisering af patienter med hovedtraumer, hvor biomarkøren S100B bruges til at identificere patienter med mildt hovedtraume som har behov for yderligere tiltag

Hvad tilføjer denne artikel til vores viden?

- Der ses generelle udfordringer med korrekt brug af SNCs guideline, hvilket bl.a. fører til unødvendige S100B blodprøver og CT-C'er

Head CT indication

S100B serum concentration dictated whether a head CT was indicated. If the concentration was below the threshold of 0.10 μg/L, the patient should be discharged without a head CT. If the concentration was above the threshold, it should result in a head CT. If this was not the case, the patient records were checked for information regarding admission for a 12-hour observational regimen. The SNC guideline suggests observation as an alternative to head CTs (4), and therefore, a 12-hour observational regimen is categorized as guideline adherent. If the patient had a head CT without indication for S100B blood sampling, it was reported as an excessive CT. If the patient was discharged without an indicated head CT, it was reported as a missing CT, provided the patient was not admitted for observation as an alternative.

Statistical analysis

For continuous variables, the normal distribution was tested with histograms and qq-plots. The variables were presented as median with interquartile ranges (IQR) in cases of not normally distributed variables. Descriptive statistics for categorical variables comprised of frequencies and respective percentages. All data was analyzed using STATA/BE 17.0 (StataCorp, College Station, Texas).

Ethical considerations

The present study was approved by the National Data Protection Agency (23/16197). Due to its retrospective nature, the need for informed consent from the study population was waived.

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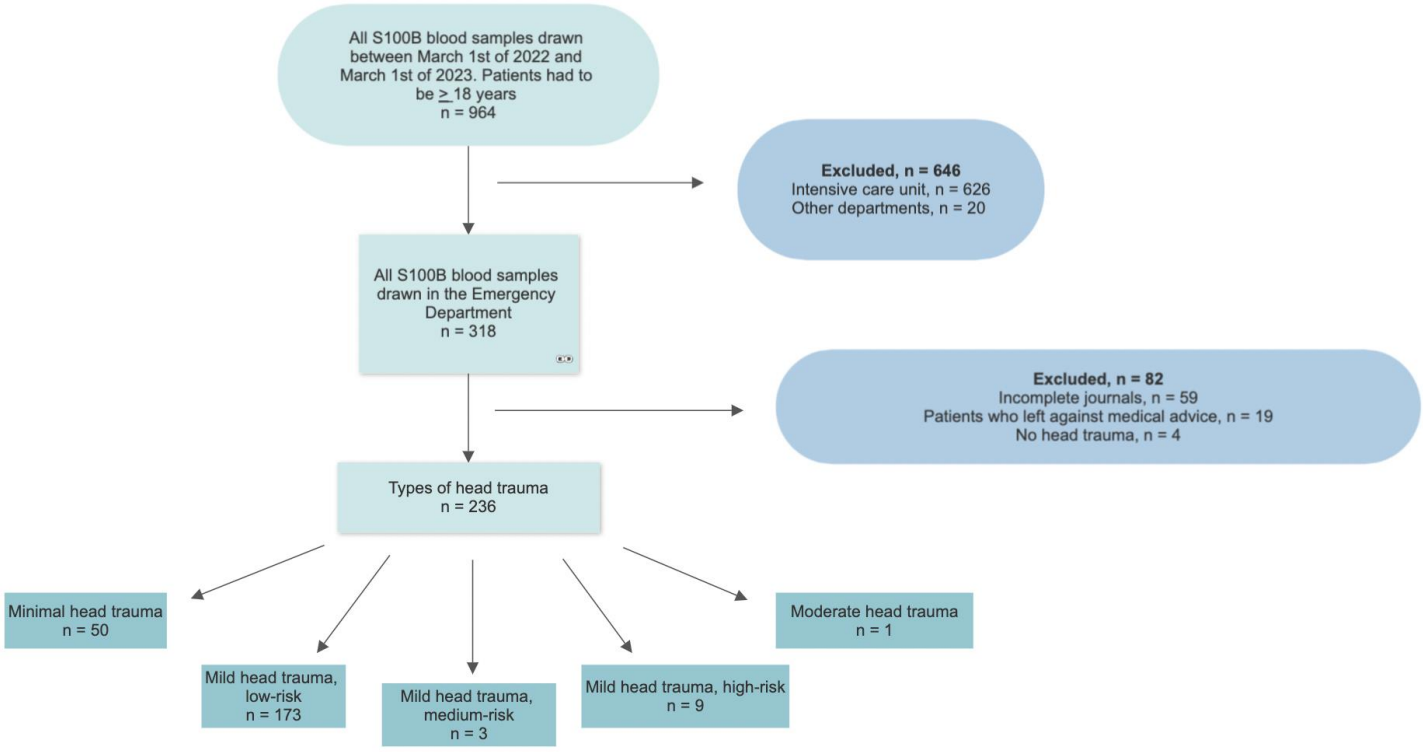
Figure 2: Flowchart of inclusion and exclusion process.



Results

Patient characteristics

This study included 236 patient cases, of which 55.1% were men. The majority (n = 173/236, 73.3%) was in the low-risk, mild head trauma category. No patients had GCS 3-8; therefore, no patients were included in the "severe" head trauma category.

A total of 102 head CTs were performed for all head trauma categories, and 11 (n = 11/102, 10.8%) had positive findings, including intracerebral hemorrhages, contusions, and skull fractures. No patients needed neurosurgical intervention or had a fatal outcome. Other baseline and clinical characteristics are summarized in Table 1.

Guideline adherence

Guideline adherence was achieved for 152 (n = 152/236, 64.4%) out of 236 patient cases across all head trauma categories. Adherence to the SNC guideline was only possible for the low-risk, mild head trauma category, as S100B blood sampling was only indicated for these patients according to the SNC guideline. The adherent group was defined as patients with S100B drawn < 6 hours after head trauma and treated according to the SNC guideline with regard to the S100B concentration (n = 147/236, 62.3%). A few patients (n = 5/236, 2.1%) with S100B above the threshold were admitted for observation instead of a head CT. These patients were also in the adherent group. Non-adherence accounted for an overall of 84 (n = 84/236, 35.6%) patient cases, referring to 21 (n = 21/173, 12.1%) in the low-risk, mild head trauma category. The non-adherence group consisted of the following four subgroups (Fig. 3).

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Table 1. Baseline and clinical characteristics of patient cases.

	Minimal head trauma (n = 50)	Mild head trauma, low risk, (n=173)	Mild head trauma, medium risk, (n=3)	Mild head trauma, high risk, (n=9)	Moderate head trauma, (n=1)	All head trauma categories, (n=236)
Age (y), n (%)						
- ***18-39***	28 (56.0)	75 (43.4)	-	3 (33.3)	1 (100.0)	107 (45.3)
- ***40-64***	13 (26.0)	66 (38.2)	-	2 (22.2)	-	81 (34.3)
- ***≥65***	9 (18.0)	32 (18.5)	3 (100.0)	4 (44.4)	-	48 (20.3)
Age (y), median (IQR)	33.6 (26.0-61.0)	44.6 (25.1-61.2)	77.2 (73.0-83.8)	47.3 (26.3-82.5)	27.2 (27.2-27.2)	43.1 (25.5-61.8)
Gender, n (%)						
- **Male**	24 (48.0)	99 (57.2)	2 (66.7)	5 (55.6)	-	130 (55.1)
- **Female**	26 (52.0)	74 (42.8)	1 (33.3)	4 (44.4)	1 (100.0)	106 (44.9)
GCS, n (%)						
- **15**	50 (100.0)	148 (85.6)	3 (100.0)	8 (88.9)	-	209 (88.6)
- **14**	-	25 (14.4)	-	1 (11.1)	-	26 (11.0)
- **13**	-	-	-	-	1 (100.0)	1 (0.4)
Cause of injury, n (%)						
- **Incidental fall**	25 (50.0)	104 (60.1)	3 (100.0)	7 (77.8)	1 (100.0)	140 (59.3)
- **Traffic accident**	15 (30.0)	46 (26.6)	-	-	-	61 (25.6)
- **Violent assault**	6 (12.0)	5 (2.9)	-	1 (11.1)	-	12 (5.1)
- **Other**	4 (8.0)	18 (10.4)	-	1 (11.1)	-	23 (9.8)
Blood thinners, n (%)						
- **None**	50 (100.0)	163 (94.2)	-	6 (66.7)	1 (100.0)	220 (93.2)
- **Anticoagulants**	-	-	-	3 (33.3)	-	3 (1.3)
- **Antiplatelets**	-	10 (5.8)	3 (100.0)	-	-	13 (5.5)
Head CT, n (%)						
- **Yes**	14 (28)	78 (45.1)	3 (100.0)	6 (66.7)	1 (100.0)	102 (43.2)
- **No**	36 (72)	95 (54.9)	-	3 (33.3)	-	134 (56.8)

The value zero is visualized by –.
n= number
y= years
IQR= interquartile range

1) All patient cases in other head trauma categories than the low-risk, mild head trauma category as S100B were not indicated for these patients (n = 63/84, 75%)
2) Late blood sampling consisting of patient cases with S100B drawn ≥ 6 hours after the time of head trauma (n = 12/84, 14.3%)
3) Patient cases where S100B was below the threshold and a head CT was still carried out leading to excessive CTs (n = 3/84, 3.6%)
4) Patient cases where S100B was above the threshold and the patient was discharged without a head CT and without being admitted for observation (n = 6/84, 7.1%), resulting in missing CTs.

S100B blood sampling, when not indicated, was the biggest cause of non-adherence in this study and, therefore, most prevalent in the minimal head trauma category. Twenty S100B blood samples were above the threshold in the minimal head trauma category, but only 14 led to a head CT.

Non-adherence due to missing head CTs and excessive CTs was calculated for the low-risk, mild head trauma category, as S100B was only indicated for this group.

Discussion

Summary of findings

This study explored the usage of S100B and adherence to the SNC guideline. A total of 236 patient cases were included in the study, mainly consisting of patients with minimal and low-risk, mild head trauma. Adherence was seen in the majority of the patient cases. Non-adherence was mainly due to excessive S100B testing seen in all other head trauma categories than the low-risk, mild head trauma category. Excessive head CTs, missing CTs,

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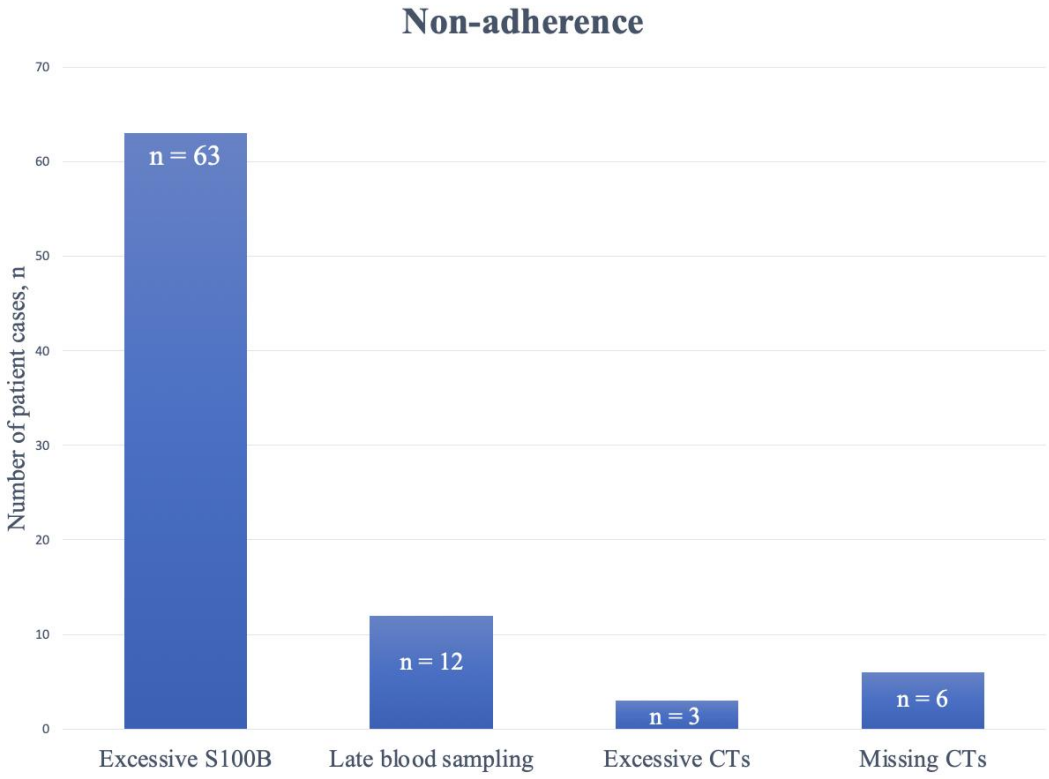
Figure 3. Bar chart of S100B non-adherence



and late S100B blood sampling were also causes of non-adherence.

Guideline adherence

Several studies have investigated adherence to the SNC guideline (7,12). Faisal et al. found low adherence to the SNC guideline, especially concerning the minimal and low-risk, mild head trauma categories (7), as reported in this study as well. Guideline non-adherence was 12.1% for the low-risk, mild head trauma category. One could argue that a non-adherence at 12.1 % is within an acceptable range. However, overall non-adherence at 35.6% still demonstrates that guideline adherence is challenged. Furthermore, Faisal et al. also found low adherence led to longer admission and excessive use of head CTs. The latter was also true for our study but to a limited extent, as excessive head CTs were a minor part of the non-adherence findings.

The excessive S100B testing could be due to physicians seeing blood sampling as an easy and inexpensive way to further help the diagnostic process regardless of the head trauma category. As there are very few adverse effects from blood sampling contrary to a head CT, it could be considered a safe and precautionary choice. However, our study found that six out of 20 patients with unnecessary S100B blood samples above the threshold did not receive a corresponding head CT. This is also seen in the study by Ananthaharan et al. and calls into question the usefulness of S100B blood sampling as a precaution when the result of

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S100B is not interpreted correctly by the physician according to the SNC guideline (13). The excessive testing could also, in part, be explained by requisition bias as patients with minimal head trauma are often triaged at a low level and, therefore, often seen by nurses before being seen by a physician. The current practice in the Danish ED is based on nurses performing a quick examination of the patient, measuring vital signs, and ordering blood tests. If the nurses are not familiar with the SNC guideline, it could lead to excessive S100B blood testing.

A study by Heskestad et al. explored guideline adherence to an older version of the SNC guideline published in 2000 (8). They came to the same conclusions: lower adherence in the minimal and mild head trauma categories led to excessive head CTs and longer admissions. The prior version of the SNC guideline did not subdivide mild head trauma into categories based on risk factors, but their findings still indicate a problem with guideline adherence in patients with non-severe head trauma (14).

Barriers and ways to improve guideline adherence

A qualitative study by Vestlund et al. identified several themes regarding ways to improve adherence to the SNC guideline (12). According to their study, the leading cause for non-adherence was poor accessibility to the SNC guideline, including a lack of physical printouts in the work environment and poor design of the hospital's intranet. Other factors contributing to non-adherence were high patient flow and stressful work situations, both common in the ED. Finding the proper guideline can be time-consuming, leading to less experienced doctors seeking advice from senior colleagues instead of using guidelines (12). The SNC guideline is highly available at the Danish ED in question. There are numerous large printouts of the modified SNC flowchart in the ED, and the printouts are also available at the Department of Radiology, as this department collaborates with the ED on the request for head CTs. Additionally, new employees are introduced to guidelines in advance by email before their first day in the ED. They also receive specific instructions on using guidelines from more experienced colleagues. It is reasonable to assume that all physicians working in the ED are familiar with the SNC guideline. Therefore, the possible reasons for non-adherence discussed by Vestlund et al. are presumably absent in the ED. According to Heskestad et al., knowledge and correctly using existing guidelines are essential for guideline adherence (8). However, the study found that despite an extensive implementation process consisting of annual mandatory courses and repeated lectures on the use of the SNC guideline by neurosurgeons, guideline adherence was still low at 51% for minimal and mild head trauma (8).

Hvad tilføjer denne artikel til vores viden?

- En større indsats for korrekt brug af SNCs guideline kan reducere antallet af unødvendige undersøgelser.

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Another reason for non-adherence could be clinical judgment overruling guidelines. The article presenting the SNC guideline 2013 specified that experienced doctors should be able to defer from guidelines and trust their clinical judgment (4). Every patient is different, and guidelines might not apply to all patients. This was also stated as a reason for non-adherence in a study by Volovici et al., which focused on guideline adherence for severe head trauma (15).

Further studies are needed to determine and identify barriers and ways to improve guideline adherence. Prospective studies with registration of reasons for non-adherence in each patient case could shed light on possible problems physicians encounter in the ED when assessing patients, though with a risk of bias. Qualitative studies could, through interviews and field research, aid in the clarification of work processes and collaboration between groups of health professionals regarding guideline adherence.

Strengths and limitations

A strength of this study was the inclusion of consecutive S100B blood samples from an entire year with no missing data. Since the primary investigators collected all the data, an agreed-upon systematic approach was established, and therefore, a high internal validity was achieved, thus making it high-quality data. However, the present study had limitations. By being a retrospective study, all data was based on existing patient records; therefore, all variables depended on the available information in the records. Another limitation is the small sample size and being a single-center study. Therefore, the results might not reflect other hospitals.

Due to the nature of the data, there was the potential for selection bias. Registering patients with head trauma without an S100B blood sample was not possible, which perhaps created groups of unreported patients and potentially affected our results for adherence and non-adherence. Examples of unreported patient cases were cases solely based on head CTs or patient cases with neither head CTs nor a blood sample. An unreported group of mild, low-risk head trauma patients with head CTs without S100B blood samples could have skewed our results concerning non-adherence by obscuring the actual number of excessive head CTs. This group could have consisted of patients with minimal head trauma treated according to the SNC guideline. These patients would have been discharged without S100B blood sampling, and the SNC guideline would have been followed correctly.

Conclusion

The SNC guideline and biomarker S100B is used in the diagnostic process regarding head trauma, and S100B is intended for patients with low-risk, mild head trauma. Overall, guideline adherence, based on S100B blood sampling, was challenged, especially for the minimal head trauma category. Guideline non-adherence in the low-risk, mild head trauma category was within an acceptable range. Non-adherence was primarily due to excessive S100B blood sampling and, to a lesser extent, due to missing head CTs, excessive head CTs, and late blood sampling. We conclude

that new research is needed to explore ways to improve guideline adherence and reasons for non-adherence to the SNC guideline.

Conflicts of interest

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Rammedelegation til den kommunale akutsygepleje og den mulige effekt på (gen)-indlæggelser og sygebesøg i almen praksis -"Middelfart- projektet"

Abstract

Background

Cooperation between primary and secondary healthcare sector can often be difficult due to different workflows and work systems among others. In this manuscript, we wanted to evaluate the effect on hospitalization and workload in general practice after implementing the delegation of point-of-care testing to the municipality's emergency nurses.

Methods

The general practitioners (GP) in one of the Lillebaelt Hospitals surrounding municipalities delegated Point-of-Care blood Testing (POCT) (C-reactive protein, creatinine, sodium, potassium, hemoglobin) to the municipality's nurses. Before the delegation, the nurses should in case of assumed patient illness, contact the GP to take the test. After the delegation, the nurses could take blood samples before contacting the GP for a treatment plan for the patient. The doctors at the emergency department (ED) had supportive functions for the GP and the nurses from the local municipality to ensure quick advice.

Results

In the first 6 months after the intervention was implemented, a total of 135 patients were seen by the nurses with the POCT equipment. Of the 135 patients 39 % were treated at home with a plan from the GP, 17 % of the patients were admitted to the hospital and 37 % of the patients were completed with no clinical intervention due to normal clinical and para-clinical evaluation. The nurses estimated that a visit from a nurse with POCT apparatus prevented 44 percent of the patients from hospital admission. In the same period, the need for home visits from the GPs was reduced by 146 visits compared to the same period in 2022. At the same time, data from the hospital showed, that the portion of patients with medical conditions from that specific municipality, who needed hospitalization, were reduced by approximately 15 percent and the re-admission rate was reduced by 20 percent comparing the same 6 months in 2023 with 2019.

Conclusion

A change of workflow in the primary sector including delegation from the GP to the municipality nurses showed a reduction in hospitalization and early recognition of disease with a possible impact on the re-admission rate from the municipality. Implementation of this simple workaround in all the Danish municipalities could have an impact on the GPs workload and the amount of unnecessary hospitalizations.

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Introduktion

Antallet af patienter, der henvises til sygehusene, afhænger af flere faktorer, der blandt andet omfatter sæsonvariation i almindelige infektionssygdomme, graden af lægetilgængelighed på f.eks. plejehjem og henvisningsmønstre fra praktiserende læger [1-3]. Kombinationen af et stort antal henviste patienter og manglende internt flow på sygehusene kan medføre overbelægning, der særligt for de mest skrøbelige patientkategorier, som ældre, kritisk syge og psykisk syge, er forbundet med øget morbiditet og forlængede hospitalsindlæggelser [4-7]. Almen praksis har henvisningsret til akut vurdering på sygehusene, dog er antallet af praktiserende læger ikke steget i samme takt som antallet af sygehuslæger over de sidste 10 år, hvilket kan udfordre lægetilgængeligheden for patienterne i primærsektoren [3]. Stort arbejdspres i almen praksis og deraf begrænset tid til konsultation i praksis eller hjemmebesøg vil kunne medføre en stigning i henvisninger af patienter til sygehuset [8]. Sundhedsstyrelsens anbefalinger til den akutte sundhedsindsats giver flere bud på, hvordan man kan optimere arbejdet omkring den akutte patient i alle sektorer [9]. Trods flere indsatser med blandt andet indførsel af plejehjemslæger i 2021 og samarbejdsaftaler mellem kommunerne og regionerne med henblik på intravenøs (IV) væske eller antibiotikabehandling i hjemmet , er indlæggelsesfrekvensen fortsat høj [10, 11].

Kommunernes organisering varierer fra kommune til kommune, og det kan være svært at sikre et ensartet tilbud på tværs, når kun minimumskrav til tilbudsudbuddet er fællesnævner. Robusthedskommissionens nyligt offentliggjorte anbefalinger til mere robusthed i sundhedsvæsenet beskriver på baggrund af tiltagende ressourcemangel og den demografiske udvikling, at sundhedsvæsenet blandt andet skal nedbringe uhensigtsmæssig behandling gennem stærkere faglig prioritering [12]. Studier har tidligere vist, at cirka 20 procent af de medicinske indlæggelser er unødvendige [13], og at en del indlæggelser kan undgås ved tidligere opsporing af sygdom [14]. Den demografiske udvikling kombineret med færre praktiserende læger kalder på alternative løsninger i forhold til behandling, hvor man ser sundhedsvæsenet som en helhed frem for sektoropdelt.

Indlæggelse kan for den ældre patient være associeret med somatisk delirium og funktionstab, som er svært at generhverve efter udskrivelse [15-19]. Det er tidligere vist, at for ældre medicinske patienter, uden akut hospitalsbehov, er det en bedre løsning at blive behandlet i eget hjem ved akut sygdom med større patienttilfredshed til følge [20,21]. Derfor er det oplagt at undersøge, hvordan sygehus, almen praksis og kommune sammen kan optimere forløbet omkring den akut syge ældre patient.

Ved et kvalitetssikringsprojekt i tæt samarbejde mellem Middelfart Kommune, almen praksis i Middelfart Kommune samt Sygehus Lillebælt (SLB) undersøgtes, om man ved en rammedelegation til akutsygeplejen med blodprøvetagning via POCT (Point-Of-Care-Testing) udstyr kunne 1) varetage flere patienter i eget hjem ved akut sygdom 2) reducere antallet af medicinske indlæggelser samt 3) reducere antallet af unødvendige sygebesøg i almen praksis.

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Metode

Kvalitetssikringsprojektet blev udført som et pilotprojekt i perioden fra 1. januar 2023 til 30. juni 2023. I Middelfart Kommune blev der via kommunens praksiskonsulent udfærdiget en rammedelegation til kommunens akutsygepleje, som – uden først at kontakte borgerens egen læge - kunne tage blodprøve på medbragt POCT udstyr. Akutsygeplejen er en specialiseret kommunal sygeplejerskefunktion, som varetager diagnostiske og behandlingsmæssige opgaver, som ligger ud over basissygeplejerskens opgaver. Akutsygeplejen i Middelfart Kommune består af 8 sygeplejersker med høj anciennitet og med erfaring i forhold til klinisk vurdering af akutte patienter. Akutsygeplejen har funktion i dag- og aftenvagter. Besøg af akutsygeplejen kan rekvireres fra mange forskellige instanser, der blandt andet omfatter egen læge, hjemmeplejen, vagtlæge, psykiatrien, plejehjem eller f.eks. kommunal KOL sygeplejerske.

På POCT udstyret var det muligt at måle C-reaktivt protein (CRP), hæmoglobin (hgb) og væsketal (kreatinin, kalium og natrium). Hvis borgerens hjemmesygeplejerske eller egen læge vurderede, at en borger skulle tilses, kunne akutsygeplejen vurdere patienten og efter blodprøvesvar lægge en plan for patienten i samarbejde borgerens praktiserende læge. Projektet fik i foråret 2023 tildelt klyngemidler fra Sundhedsklyngen i akutsygehusets optageområde for at kunne drive projektet frem til sommeren 2024. Midlerne blev brugt på en ekstra akutsygeplejerske.

Projektets målgruppe var alle borgere med akut sygdom, som af forskellige årsager ikke kunne komme til egen læge grundet manglende kørselsmulighed eller den aktuelle sygdom. Indikation for visitation til akutsygeplejen blev opdelt i følgende kategorier: 1) mistanke om infektion, 2) mistanke om dehydrering, 3) mistanke om anæmi og 4) andet (f.eks. konfusion, dyspnø eller øvrige sygdomstegn).

Alle lægepraksis i Middelfart Kommune tilsluttede sig rammedelegationen, og igennem drøftelse med Praktiserende Lægers Organisation (PLO) og SLB blev det besluttet at ved behov for opsætning af IV væske/antibiotika, skulle Akutafdelingen på Kolding Sygehus kontaktes med henblik på ordination af IV behandling i det fælles medicinkort. Den praktiserende læge havde ansvaret for behandlingen på hverdage mellem klokken 8-16. På øvrige tidspunkter indgik Akutafdelingens vagthold som sparringspartner og som behandlingsansvarlig frem til næste morgen på hverdage. I disse tilfælde blev der lavet et notat i den elektroniske patientjournal, som efterfølgende blev sendt til kommunen og almen praksis.

POCT udstyret med dertilhørende blodprøvekits blev finansieret af Sygehus Lillebælt, og der blev etableret et depot på Middelfart Sygehus til IV væske og IV antibiotika samt dertilhørende utensilier, som kunne anvendes, hvis der fandtes indikation herfor.

Ved hjælp af et afkrydsningsskema skulle akutsygeplejen registrere følgende mulige udfald af besøget: 1) indlæggelse, 2) behandling i eget hjem, 3) kontrol inden for 24 timer, 4) henvisning til egen læge eller 5) ikke behov for intervention. Ved samme afkrydsningsskema skulle akutsygeplejen desuden vurdere, hvorvidt interventionen havde forebygget en indlæggelse, og i hvilke tilfælde POCT udstyret gav dem en bedre diagnostisk sikkerhed. Akutsygeplejens vurdering blev efterfølgende sammenlignet med medicinske indlæggelsesrater fra Middelfart Kommune til Sygehus Lillebælt fra januar år 2023 til og

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med juni 2023, hvor projektet var i gang. Disse indlæggelsesrater blev herefter sammenholdt med raterne for samme periode i år 2019 for at se, om der var forskel før og efter ændringen af arbejdsgangen. År 2019 blev valgt, da årene 2020 og 2021 var præget af COVID-19 epidemien. År 2022 blev fravalgt, da man i Region Syddanmark skiftede elektronisk patientjournal i foråret 2022, hvilket har vanskeliggjort et præcist datatræk. Genindlæggelsesfrekvensen inden for 30 dage fra samme kommune blev også registreret. Projektet var et pilot – og kvalitetssikringsprojekt og således ikke et interventionsstudie med randomisering til ydelsen "akutsygepleje med blodprøve", hvorfor en direkte sammenligning af effekt med og uden ydelsen ikke var mulig i samme population. Ved at sammenligne indlæggelses-og genindlæggelsesraten i Middelfart Kommune med sygehusets øvrige optagekommuner, hvor indsatsen ikke var implementeret, forsøgtes effekt af indsatsen yderligere isoleret. Vejen Kommune deles mellem Sygehus Lillebælt og Sydvestjysk Sygehus, og er ikke medtaget i opgørelsen. Indlæggelser blev opgjort pr 1000 indbyggere og genindlæggelser i procent af antal af medicinske indlæggelser. Akut ambulante kontakter er ikke medtaget. Data vedrørende sygebesøg i almen praksis i Middelfart kommune blev indhentet fra regionen, hvor data fra studieperioden blev sammenholdt med første halvår af 2022, idet plejehjemslæge-ordningen blev indført i 2021, og dermed kunne have betydning for data før 2021.

Der blev løbende afholdt evalueringsmøder mellem praksiskonsulenten for Sygehus Lillebælt, afdelingsledelsen for Akutafdelingen på Kolding Sygehus og chefen for den kommunale hjemme – og akutsygepleje for at sikre at eventuelle udfordringer kunne håndteres. Områdelederen for akutsygeplejen i Middelfart kommune gennemgik alle forløbene med henblik på, om interventionen reelt havde forebygget en indlæggelse eller blot udskudt dem timer eller døgn. Auditten blev også gennemført for at sikre, at arbejdsgangsændringen ikke medførte en forsinkelse af relevant behandling og en evt. nødvendig indlæggelse. Der er ikke ansøgt om tilladelse ved videnskabsetisk komité, da der var tale om et kvalitetsudviklingsprojekt.

Tabel 1. Visiterende enhed til akutteam og resultatet af besøget fra akutteamet. Øvrige visitatorer er f.eks. psykiatrien, stamafdeling på sygehus eller en kommunal KOL sygeplejerske

VISITERENDE ENHED	ANTAL	RESULTAT	ANTAL
EGEN LÆGE	76 (56 %)	Behandling i eget hjem	52 (39 %)
HJEMMEPLEJEN	18 (13 %)	Indlæggelse	23 (17 %)
VAGTLÆGE	18 (13 %)	Opfølgende besøg inden for 24 timer	10 (7 %)
ØVRIGE	23 (17 %)	Ingen intervention	50 (37 %)
I ALT	135		135

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Resultater

I alt 135 patienter fik besøg af akutsygeplejen med POCT udstyret i projektperioden. I tabel 1 fremgår det, hvem der visiterede til akutsygeplejen inkl. blodprøvetagning samt besøgets udfald. Indikationen for blodprøvetagning og besøg fra akutsygeplejen var i 89 % af tilfældene mistanke om infektion.

Ud af de 135 borgere fik 94 % borgere målt en CRP, 81 % borgere en hgb og 29 % borgere væsketal.

Efter hvert besøg vurderede akutsygeplejersken fra akutsygeplejen, ud fra afkrydsningsskemaet beskrevet under metodeafsnittet, at man hos 60 (44 %) borgere havde forebygget en indlæggelse. Akutsygeplejen vurderede, at besøget med blodprøvetagning gav en bedre diagnostisk sikkerhed hos 38 (28 %) af borgerne. Audit af forløbene for de borgere, der ikke blev indlagt i forbindelse med akutsygeplejens besøg, viste, at ingen af borgerne blev indlagt inden for 2 døgn efter besøget. Hos 3 patienter fandtes indikation for behandling med IV antibiotika, hvor de øvrige patienter med indikation for antibiotikabehandling blev behandlet peroralt.

Opfølgende instans efter akutsygeplejens besøg var i 52 % af tilfældene egen læge, i 22 % af tilfældene vagtlæge (primært læger i vagt fra Middelfart Kommune), i 26 % af tilfældene en sygehus stamafdeling, psykiatrien eller akutafdelingens akutlæge, hvoraf henvendelse til akutafdelingen for rådgivning kun udgjorde 9 % (3 opkald).

Tabel 2. Antal indlæggelser fra Middelfart kommune og sygehusets øvrige optage kommuner pr. 1000 indbyggere i første halvår af 2019 og 2023

KOMMUNE	MIDDELFART	FREDERICIA	KOLDING	VEJLE
INDBYGGERTAL 2019	38553	51427	92893	114830
INDBYGGERTAL 2023	39961	52173	94528	120949
INDLÆGGELSER 2019	11.93	14.17	11.49	15.98
INDLÆGGELSER 2023	10.12	12.04	10.39	15.11
FALD I PROCENT	15.2 %	15 %	9.6 %	5.4 %

Tabel 3. Antal medicinske indlæggelser og genindlæggelser fra Middelfart Kommune og sygehusets øvrige optage kommuner første halvår af 2019 og 2023 i absolutte tal, genindlæggelsesprocent og ændringen af genindlæggelser i procent.

KOMMUNE	MIDDELFART	FREDERICIA	KOLDING	VEJLE
INDLÆGGELSER				
2019	460	729	1068	1835
2023	404	626	982	1828
GENINDLÆGGELSER				
2019	60 (13.0 %)	103 (14.1 %)	160 (15.0 %)	306 (16.7 %)
2023	42 (10.4 %)	76 (12.1 %)	122 (12.4 %)	275 (15.0 %)
ÆNDRING I PROCENT	- 20.3 %	- 14.2 %	- 17.2%	- 10.2 %

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For almen praksis i Middelfart Kommune blev der registreret en reduktion i antallet af sygebesøg fra 1938 besøg i de første 6 måneder af 2022 til 1792 besøg i de første 6 måneder af 2023. Data for de øvrige kommuner kendes ikke.

For at kvalificere den kommunale akutsygeplejes vurderinger af arbejdsgangsændringens effekt, foretog sygehuset dataudtræk på medicinske indlæggelser pr 1000 indbyggere fra Middelfart Kommune og de øvrige optagekommuner, hvilket fremgår af tabel 2.

Tabel 3 viser, at genindlæggelsesprocenten faldt med 20,3% for Middelfart kommune, hvor det for de sammenlignede kommuner lå mellem 10,2 – 17,2%. Akutsygeplejen vurderede, at 33 (25 %) borgere blev opstartet i behandling tidligere end ved vanligt regime med kontakt til egen læge med efterfølgende sygebesøg eller konsultation ved egen læge.

Diskussion

Dette kvalitetssikringsprojekt viste, at en rammedelegation på POCT udstyr til akutsygeplejen i Middelfart kommune forebyggede, ifølge akutsygeplejens egen vurdering, hospitalsindlæggelse for 44% af borgerne. Samtidig viste data fra Sygehus Lillebælt en reduktion i (gen)-indlæggelser fra Middelfart Kommune i projektperioden sammenlignet med samme periode i 2019 og sammenlignet med sygehusets øvrige optagekommuner. I projektet fokuseredes på patienter med medicinske sygdomme og behovet for medicinske indlæggelser. Langt de fleste patientforløb kunne håndteres i dagstiden i samarbejde mellem egen læge og akutsygeplejen. Akutafdelingens personale blev således kun sjældent involveret. I 25 % af tilfældene blev der ifølge akutsygeplejens vurdering opstartet behandling tidligere end ved tidligere arbejdsgang, hvor egen læge blev kontaktet før et evt. besøg af akutsygeplejen. Der fandtes i projektperioden et fald i antallet af sygebesøg i almen praksis i sammenlignet med 2022.

Øget og tættere samarbejde mellem sundhedsvæsenets interessenter er bydende nødvendigt, hvis vi i fremtiden skal kunne håndtere den demografiske udvikling uden tilførsel af ekstra ressourcer i sektorerne. Tidligere forskning viser, at behandling af ældre borgere i hjemmet er et godt alternativ til indlæggelse med hensyn til patienttilfredshed og behandling [20,21]. Flere akutafdelinger indgår samarbejde med almen praksis og kommuner om hjemmeindlæggelser, som beskrevet ved Hospitalsenheden Midt [11]. Nærværende projekt fokuserer på at identificere syge patienter tidligt i kommunalt regi, hvor akutsygeplejen efterfølgende i samarbejde med egen læge eller akutafdelingen vurderer, hvorvidt behandlingen kan varetages hjemme eller om patienten kræver indlæggelse. Samtidig foretager akutsygeplejen den kliniske vurdering i kombination med blodprøver via POCT udstyr, som ligeledes i projektet vurderes at øge den diagnostiske sikkerhed ved 28 procent af patientforløbene.

Når der er sparsom tid i almen praksis, og den syge har besvær med at komme til den praktiserende læge, kan det betyde indlæggelse uden klinisk vurdering eller støttende biokemi, og dermed øget sandsynlighed for unødige be-

FAKTABOKS:

- Rammedelegation til akutsygeplejen i kommunen og Point-of-Care-Testing (POCT) udstyr, i kombination med faglig sparring fra almen praksis og sygehus, gør det muligt at opspore tidlig sygdom og reducere medicinske (gen)-indlæggelser og behov for sygebesøg fra almen praksis.

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søg på sygehuset. Desuden kan støttende biokemi kvalificere en eventuel indlæggelse og dermed sikre, at patienten får den bedste behandlingsstart på sygehuset. I almen praksis vil man samtidig kunne afslutte eller finde andre tilbud til et stort antal patienter ved hjælp af kvalificering af patientens tilstand ved akutsygeplejen. I projektet blev 37 procent af patienterne afsluttet uden intervention efter akutsygeplejens besøg, hvilket kan have medvirket til faldet i sygebesøg i kommunen for almen praksis. Hjemmebesøg er stadig en kerneopgave i almen praksis, men ved at der inden besøget er foretaget kvalificeret vurdering ved akutsygeplejen inklusiv blodprøvetagning, kan behandlingen til den enkelte patient målrettes betydeligt. Flere besøg vil formentlig i stedet kunne klares ved telefonkonsultation med god kommunikation mellem patient, akutsygeplejerske og praktiserende læge. På den måde vil akutsygeplejen være den praktiserende læges sparringspartner hos patienten, hvilket gør det muligt at tilse flere akut syge borgere uden at gå på kompromis med andre opgaver i almen praksis. Akutsygeplejen får dermed en større opgave i de enkelte kommuner, og vil i de fleste kommuner skulle opnormeres for at hindre for stor arbejdsmængde og tidspres, hvis flere borgere skal vurderes og behandles hjemme.

I december 2023 vedtog Folketinget lov om forbeholdt virksomhedsområde for sygeplejersker [22], hvilket medførte kritik fra Lægeforeningen [23]. Projektet er efter vores viden et af de første, hvor den praktiserende læge giver rammedelegation til den kommunale sygepleje til måling af blodprøver ud over blodsukkermåling. Projektet understøtter lovgivningens formål, og der er ikke observeret udfordringer med hverken patientsikkerhed eller uklar ansvarsfordeling, idet arbejdsgangene har været klart beskrevet.

Samlet set vil det være en samfundsøkonomisk gevinst ved at kunne behandle borgere i eget hjem, da ydelserne i praksis og kommuner sammenholdt med sygehusbehandling er væsentligt billigere inklusive sparrede udgifter til påkrævede ekstra ydelser i hjemmepleje efter indlæggelse grundet indlæggelsesrelaterede funktionstab [24,25]. Ved at øge de diagnostiske muligheder i kommunen, sikrer man et ensartet tilbud for borgeren uden at være afhængig af den enkelte praktiserende læges organisering og udstyr. Ingen af Middelfart Kommunes praktiserende læger har transportabelt udstyr til blodprøvetagning som kan sammenlignes med POCT.

Den kommunale akutsygeplejerske kompetenceudvikles ved kontinuerlig sparring med den praktiserende læge og/eller akutafdelingen, således at de faglige vurderinger kombineret med blodprøver bliver endnu bedre. Udstyr som POCT test til blodprøvetagning, kalibreret og kontrolleret på sygehusets laboratorium og kontinuerlig kompetenceudvikling er nødvendig for at kunne sikre, at kommunerne hensigtsmæssigt kan håndtere de mange ældre patienter. Her spiller samarbejdet med sygehuset en væsentlig rolle i vidensdeling, kvalitetssikring og direkte telefonrådgivning. I projektperioden har langt de fleste patienter dog kunnet håndteres af egen læge i dagstid uden involvering af sygehusets personale.

Projektet har også begrænsninger. Vi har ladet akutsygeplejen vurdere, hvorvidt en indlæggelse er forebygget. Antallet af særligt genindlæggelser fra Middelfart Kommune er reduceret, hvilket understøtter akutsygeplejens vurderinger, da en tidlig opsporing af forværring af sygdom efter indlæggelse er vigtig for at forhindre genindlæggelser. Dog kan man ved studiets design ikke konkludere en direkte kausal sammenhæng, idet indsatsen ikke

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er implementeret som et forskningsprojekt med randomisering til ydelsen "akutsygeleje og POCT test". Det vanskeliggør en direkte sammenligning af effekt med og uden ydelsen i samme population. Alle sygehusets optagekommuner viser et fald i medicinske indlæggelser i samme periode. Det kan skyldes, at sygehusets akutte modtageafdelinger i Kolding og Vejle kan have ændret arbejdsgange for at reducere antallet af indlæggelser i de medicinske sengeafdelinger mod at flere patienter håndteres i Akutafdelingen som akut ambulante. Samtidig kan de øvrige kommuner have haft et fokus på tidlig opsporing af sygdom eller andre initiativer, som vi ikke har været vidende om . I samme periode er den præhospitale visitationsenhed implementeret i samarbejde med Præhospitalet i Region Syd [26]. Den præhospitale visitationsenhed har via Akut Medicinsk Koordinering i regionen dækket Middelfart, Fredericia og Kolding kommuner ved primært 112 opkald, og i gennemsnit haft 2 kørsler på hverdage i projektperioden fordelt i alle kommuner. Vi vurderer derfor, at den præhospitale visitationsenhed ikke har haft væsentlig betydning for resultaterne. Der er ikke gennemført medarbejdertilfredshedsundersøgelse i hverken primær eller sekundær sektor i projektperioden, hvilket vil være et oplagt fokus ved eksempelvis udbredelse af projektet.

I dette pilotprojekt har almen praksis givet akutsygeplejen i Middelfart kommune rammedelegation til blodprøvetagning før kontakt til egen læge eller sygehus. Vi viser, at flere patienter kan behandles hjemme frem for indlæggelse på sygehus. Udbredelse af projektet til andre kommuner kan bidrage til, at flere patienter kan behandles tidligere og trygt hjemme med samtidig kvalificering af de patienter, som sygehuset skal varetage. I forbindelse med en eventuel udbredelse af projektet vil der være behov for yderligere undersøgelse af arbejdsgangen i forhold til blandt andet patientforløb, patient-og medarbejdertilfredshed samt de økonomiske aspekter i alle sektorer.

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Korte protokol artikler

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Korte protokol artikler

The association between serial measurements of cardiac parameters on ultrasound and prognosis in adult emergency department visits: a systematic review protocol

Abstract

Introduction

Emergency department (ED) visits are often due to dyspnea or chest pain caused by underlying cardiopulmonary diseases. Point-of-care cardiac ultrasound is often used in the primary patient evaluation integrated with clinical assessment. However, standard follow-up solely relies on symptoms, vital signs, and laboratory findings.

Objective

The objective of this systematic review is to examine the association between serial changes in dynamic cardiac ultrasound parameters and prognosis in adult ED visits.

Methods

Studies with adult ED visits who underwent cardiac ultrasound at least twice during admission will be included. Mechanically ventilated patients will be excluded. A systematic search will be performed on PubMed, Cochrane, Embase, Scopus, Web of Science, and Google Scholar. The grey literature will be sought in ProQuest. Ongoing trials will be sought in ClinicalTrials, and the International Clinical Trials Registry Platform. The risk of bias will be assessed according to the study design using the Joanna Briggs Institute critical appraisal tools. Results will be synthesized in a meta-analysis if applicable; otherwise, in narrative form.

Discussion

The results are anticipated to provide new insights on how to monitor and guide treatment based on serial measurements of cardiac function on ultrasound.

Keywords: Emergency department; monitoring; prognosis; serial measurements; cardiac ultrasound; PoCUS; point-of-care ultrasound

Systematic review registration number: PROSPERO, CRD42024524740.

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Introduction

Emergency department (ED) visits are frequently prompted by dyspnea and chest pain, indicative of cardiopulmonary diseases such as acute heart failure, pulmonary embolism, and acute coronary syndromes (1).

Point-of-care ultrasound (PoCUS), particularly focused cardiac ultrasound (FoCUS) and lung ultrasound (LUS), is important in the ED for the swift evaluation of these patients, enabling clinicians to assess cardiopulmonary conditions and guide immediate diagnostic and treatment decisions (2–4).

While FoCUS and LUS are established for initial assessment, standard follow-up relies on observing symptom progression, vital signs, and medical test results. A systematic review has synthesized the implications of serial changes in B-lines on lung ultrasound and inferior vena cava diameter, presenting promising findings related to patient outcomes (5). Building on this knowledge, there is potential for other dynamic ultrasound findings on cardiac ultrasound, e.g., ejection fraction (EF), tricuspid annular plane systolic excursion (TAPSE), and the right ventricular-to-left ventricular (RV/LV) ratio, to enhance patient management. However, while ultrasound-guided treatment has proven effective for rapidly reducing dyspnea (6), the implications of longitudinal changes in cardiac parameters have only been investigated in small studies. In a pilot study, combined FoCUS and LUS demonstrated a larger decongestion in acute heart failure patients, thereby reducing mortality and rehospitalization (7). Additionally, serial TAPSE and RV dilatation monitoring in diagnostically undetermined dyspneic patients could detect developing pulmonary embolism (8). Despite these advances, comprehensive data on the longitudinal impacts of cardiac ultrasound parameters on patient outcomes are still lacking.

The objective of the systematic review is to examine the association between serial measurements of dynamic parameters (TAPSE, EF, and RV/LV ratio) assessed through cardiac ultrasound and prognosis (mortality, readmissions, length of stay, and intensive care unit transfers) in adult ED visits. Additionally, the trend in these parameters during admission will be investigated.

Methods

The systematic review will adhere to the Joanna Briggs Institute methodology for systematic reviews of effectiveness (9) and the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines (10,11). Before commencing the review, it has been registered with PROSPERO (CRD42024524740).

Eligibility Criteria

Participants: We will include studies on adult ED visits aged 18 years or older, while studies only on mechanically ventilated patients will be excluded due to the potential impact of mechanical ventilation on cardiac function.

Intervention: Studies assessing serial changes in dynamic parameters (EF, TAPSE, and RV/LV ratio), were measured using cardiac ultrasound (e.g., echocardiography or focused cardiac ultrasound) at least twice during the hospital admission.

Comparator: Specific comparator criteria are not imposed; our focus is on assessing dynamic cardiac parameter changes during admission.

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Outcomes: This review will consider studies that report the following clinical outcomes: Mortality, readmissions, length of hospital stay, and intensive care unit transfers during admission, and trends in serial changes in EF, TAPSE, and RV/LV ratio during hospital admission.

Types of Studies: Randomized and non-randomized controlled trials, observational studies (cohort and case-control), and conference abstracts (based on these types of study designs) will be considered for inclusion, excluding other systematic reviews. Both published and unpublished trials will be included. No language restrictions will be imposed, as articles in unfamiliar languages will be translated.

Search Strategy

The search strategy was developed in collaboration with a research librarian and combined specific text words and their synonyms and index terms, such as MESH terms in PubMed. The basic search string will consist of keywords from the research question: "Focused cardiac ultrasound/echocardiography" AND "serial/repeated/monitoring" AND "emergency/hospitalization/admission". This search strategy will be adapted for each information source included. Additionally, the reference lists of selected studies will be screened, and citation-searching will be done on PubMed, Embase, Scopus, and Web of Science to find further relevant studies.

Hvad ved vi?

- Fokuseret hjerteultralyd (FoCUS) er en integreret del af den initiale undersøgelse hos mange akutte kontakter, især ved åndenød og brystsmerter

Information sources

A systematic search will be performed on PubMed, Cochrane, Embase, Scopus, Web of Science, and Google Scholar. The grey literature will be sought in ProQuest. Ongoing trials will be sought in Clinical Trials and the International Clinical Trials Registry Platform (ICTRP), and authors will be contacted for preliminary results.

Study Selection

Identified studies will be imported into Covidence (Veritas Health Innovation, Melbourne, Australia) for duplication check, screening, and data extraction. Two reviewers (VVV and WWW) will independently screen titles and abstracts against the inclusion criteria. Potentially relevant studies will have their full texts retrieved and assessed by the same two reviewers. Reviewer disagreements will be resolved through discussion or consultation with a third reviewer (XXX). Interrater reliability between the two reviewers will be reported. The study selection process will be presented in a Preferred Reporting Items for Systematic Reviews and Meta-analyses (PRISMA) flow diagram (10).

Risk of bias in studies

Eligible studies will undergo critical appraisal by two independent reviewers (YYY and ZZZ) using standardized critical appraisal instruments provided by Joanna Briggs Institute for experimental, quasi-experimental, and observational studies (9). Authors of papers will be contacted to request missing or additional data for clarification when necessary. The critical appraisal results will be presented in a table with a narrative description. Regardless of their methodological quality, all studies will be included in data extraction and synthesis.

Data Extraction

Two independent reviewers (VVV and WWW) will extract data using the inbuilt function in Covidence and according to a predefined data collection form. Any discrepancies will be resolved through discussion or consultation with a third reviewer (XXX). Authors will be contacted to obtain missing or additional data when needed. Data will include general information (authors, year, country, and funding), methods (study design, single- or multicenter study), cohort (age, sex, sample size, and symptoms/diagnoses), intervention (cardiac ultrasound scanning protocol, and scanning interval), and primary (mortality, readmissions, length of hospital stay, and intensive care unit transfers) and secondary outcomes (changes in EF, TAPSE, and RV/LV ratio). The extracted data will be represented in a table.

Data Synthesis

Statistical meta-analysis will be conducted using RevMan V5.4.1 (The Nordic Cochrane Centre, The Cochrane Collaboration, Copenhagen, Denmark), and effect sizes will be expressed as odds ratios for dichotomous data or weighted (or standardized) mean differences for continuous data, along with their 95% confidence intervals. Heterogeneity will be assessed using chi-square (χ^2) with a p-value cutoff at 0.10 due to the test's low power (12), and an I^2 statistic over 50% will be considered indicative of substantial heterogeneity. Subgroup and sensitivity analyses will be performed in patients with a final diagnosis of acute heart failure, pulmonary embolism, and shock (cardiogenic and hypovolemic) because it is anticipated that dynamic changes in cardiac parameters are especially seen in these conditions. In cases where statistical pooling is not possible, a narrative synthesis with tables and figures will be presented. Publication bias will be assessed using funnel plots if 10 or more studies are included in a meta-analysis. Statistical tests for funnel plot asymmetry (Egger test, Begg test, Harbord test) will be performed where appropriate.

Assessing Certainty in the Findings

An overall assessment of the robustness of evidence will be conducted using the Grading of Recommendations, Assessment, Development, and Evaluation (GRADE) approach (13). The results will be presented in a Summary of Findings (SoF) table, where the certainty of the evidence for each outcome will be rated. Two independent reviewers (VVV and WWW) will perform this evaluation. Any disagreements will be resolved through discussion or by involving a third reviewer (XXX). The SoF will be created using GRADEpro (McMaster University, ON, Canada).

Discussion

In the systematic review following this review protocol, we aim to explore the implications regarding the use of serial cardiac ultrasound in the ED/hospital setting. Our focus on the changes in EF, TAPSE, and RV dilatation in relation to patient outcomes is expected to provide new insights that could have implications in clinical practice.

Hvad tilføjer denne artikel til vores viden?

- Ved FoCUS kan en række dynamiske parametre vurderes, herunder venstre og højre hjerte-halvdels funktion, der antageligt ændrer sig allerede i akutfasen i takt med patientens kliniske tilstand

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The anticipated findings of this review may enhance the understanding of PoCUS, particularly its application beyond immediate diagnosis to ongoing patient management in ED settings. This could lead to more informed clinical decision-making, especially in the monitoring and treatment of patients with cardiopulmonary symptoms. Additionally, our review is likely to identify areas where further research is necessary, especially in understanding the long-term implications of changes in cardiac parameters.

It is crucial to note that these anticipated outcomes are speculative at this stage and dependent on the systematic review results. The findings may confirm or refine these expectations or present new challenges and perspectives. As with any review, the conclusions drawn will be limited by the quality and scope of the studies included. Nonetheless, this protocol sets the stage for a systematic review that seeks to contribute to the body of knowledge in emergency medicine and the practical application of PoCUS in patient care.

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Accidental hypotermi induceret Ventrikulær Takykardi

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Keywords:
Accidental hypotermi;
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Abstract

68-årig tidligere rask mand bliver afkølet i forbindelse med udendørstræning og udvikler hypotermi udløst ventrikulær takykardi under genopvarmning ved ankomsten til akutmodtagelsen.

Kasuistikken er skrevet for at skabe opmærksomhed på risikoen for udvikling af maligne arytmier i relation til svær hypotermi eller behandling af denne, for dermed at opstarte korrekt monitorering og behandling ved modtagelsen af patienten allerede i akutmodtagelsen.

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I denne kasuistik beskrives et tilfælde af ventrikulær takykardi udløst af accidental hypotermi. Den nedsatte kropstemperatur kan ændre den elektriske ledningsevne og repolarisering af hjertecellerne, hvilket skaber en prædisposition for ventrikulær takykardi.

Sygehistorie

68-årig mand, tidligere rask og uden disponerende faktorer til iskæmisk hjertesygdom, indlægges efter at have cyklet 60 km i koldt vejr. Vidner ser ham stå af cyklen og finder ham bleg og let konfus, hvorfor ambulancen tilkaldes. I ambulancen måles et blodsukker på 3,3 mmol/liter(L), efter at patienten havde indtaget æblejuice, og en umålelig lav temperatur på termometret Braun Thermoscan 7. Tele-EKG viser inkomplet højresidig grenblok og atrieflimren med frekvens på 118.

Ved ankomsten til sygehuset er patienten vågen, relevant og uden klager. Der måles et blodtryk på 84/18 mmHg uden samtidig puls bliver monitoreret. Der gives 2 liter opvarmet isoton natriumchlorid til hurtigt indløb samt 1 liter isoton glukose. Vådt tøj fjernes og erstattes af Bair-Hugger tæppe. Kort efter bliver patienten utilpas. Han tilkobles ekstern defilbrilator og der konstateres, at patienten har ventrikulær takykardi med frekvens på 190. Patienten behandles med bolus cordarone 300 mg intravenøst(IV), hvorefter patienten konverterer til en normofrekvent sinusrytme.

FAKTABOKS:

- Accidental hypotermi er en potentiel livsfarlig tilstand.
- Accidental hypotermi kan udløse ventrikulær takykardi under genopvarmning.
- Grundig monitorering, herunder elektrokardiogram (EKG) overvågning er vigtig ved modtagelse af patienter med accidental hypotermi.

Initial arteriel blodgas analyse (A-gas) viser metabolisk acidose med pH 7,15, laktat 5,4 mmol/L, kalium 2,2 mmol/L og glukose 3,9 mmoL/L. Kontrol A-gas 1 time efter viser aftagende acidose med pH 7,26, kalium 3,8 mmol/L og normale elektrolytter samt glukose.

Videre ekstern opvarmning med 1 °Celsius i timen foregår ukompliceret. Der observeres ingen yderligere arytmi-tilfælde under 9 dages indlæggelse. For at udelukke strukturel-, iskæmisk hjertesygdom eller belastningsudløst VT udføres ekkokardiografi, hjerte-Magnetisk Resonans (MR), hjerte-Computer Tomografi (CT) og EKG overvåget cykeltest, som alle var normale. Udskrives med en Loop-recorder som 1 år efter er uden fund af arytmi.

Diskussion

Hypotermi kan nedsætte ledningsevnen af elektriske impulser gennem hjertet, påvirke funktionen af ionkanaler (natrium-, calcium- og kaliumkanaler) i hjertecellernes cellemembran samt påvirke repolariseringen af hjertecellerne, hvilket kan forårsage forlængelse af aktionspotentialet. Dette kan ses på elektrokardiogrammet som forlængelse af QT-intervallet. Alle disse ændringer skaber en elektrisk ustabilitet i hjertet, hvilket øger risikoen for alvorlige arytmier.

Ved ekstern opvarmning er der en risiko for fald i kernetemperaturen, og dermed en forværring af den centrale hypotermi. I vores kasuistik er en central temperatur ikke beskrevet.

Risikoen for arytmier er højere under opvarmning af hypoterme patienter og det er derfor vigtigt at håndtere genopvarmningen omhyggeligt(1). Hypotermi kan føre til en forskydning af kalium mellem cellerne og det eks-

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tracellulære rum(2). Ved opvarmning kan denne forskydning resultere i pludselige ændringer i kaliumkoncentrationen, hvilket kan påvirke hjertets elektriske ledningsevne og repolarisering og dermed øge risikoen for arytmier. Opvarmning kan accelerere kaliumskift og yderligere forværre hypokaliæmi, hvilket er en kendt risikofaktor for arytmier. I vores sygehistorie har patienten kalium på 2,2 mmol/l på den første A-gas som korrigeres til 3,8 mmol/L efter 1 time.

Flere studier beskriver accidental hypotermi som eneste årsag til arytmi og død. I et svensk studie gennemgik Brändström et al 362 indlæggelser med accidental hypotermi i en periode på 8 år. I det retrospektive studie var der ikke undersøgt for arytmier, men dødeligheden var på 6 %, hvoraf 15/16 dødsfald var forårsaget af pludselig hjertestop, som blev tilskrevet hypotermi. I studiet var der flere mænd end kvinder, der blev hypoterme under udendørsaktivitet og disse var generelt yngre end kvinderne (3). I et større international registerstudie gennemgik man 201 indlæggelseskrævende tilfælde med accidental hypotermi i en periode på 10 år, hvoraf størstedelen var mænd. 73 (36 %) fik hjertestop, og ved ankomst på sygehuset havde ca. halvdelen en stødbar rytme (4). Li et al. Har beskrevet en case med vedvarende ventrikulær takykardi hos en 82 årig mand under operation for benign prostata hypertrofi, hvor man ligeledes ikke fandt anden udløsende årsag end hypotermi (5).

Denne kasuistik er skrevet for at skabe opmærksomhed på, at accidental hypotermi kan udløse ventrikulær takykardi, da manglende monitorering, herunder EKG og biokemi ved modtagelse samt opvarmning af patienten i akutmodtagelsen, kan forlænge tiden til potentielt livredende behandling.

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Popliteaaneurisme – en sjælden differentialdiagnose ved ultralydsskanning for dyb venetrombose

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Abstract

The patient presented with three days of increasing pain in the left knee and lower leg. Point of care ultrasound showed an aneurysm of the popliteal artery with thrombosis. CT found bilateral aneurysms of the popliteal arteries; the patient was treated with a venous bypass. This report explores a unique case of a differential diagnosis of a deep venous thrombosis.

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Case

Kasuistikken beskriver en sjælden differentialdiagnose til en dyb venetrombose (DVT).

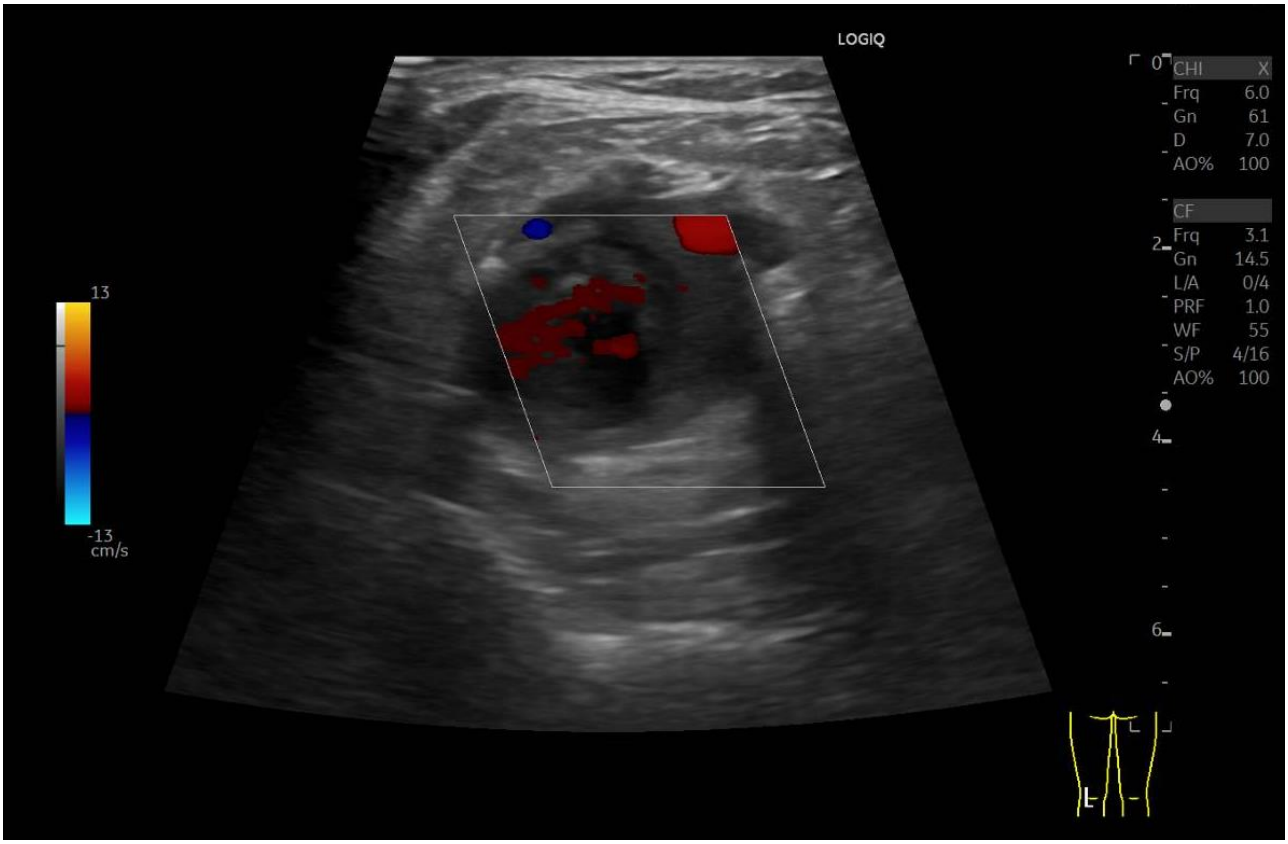
Den 58-årige patient blev henvist af egen læge til FAM på grund af mistanke om DVT i den venstre underekstremitet. Igennem de sidste tre dage var der opstået langsomt tiltagende smerter i venstre knæhase og på bagsiden af venstre underben. Smerterne blev forværret ved gang; der var ingen smerter i hvile. Der var ingen kendte risikofaktorer for DVT. Underekstremiteten var ikke hævet, og der kunne påvises palpationsømhed i knæhasen. Pulsen i venstre a. dorsalis pedis og a. tibialis post. kunne ikke palperes. D-dimer var forhøjet til 21.3 mg/L, CRP til 19 mg/L.

Point of Care Ultralyd (PoCUS) blev anvendt til at udelukke DVT og afslørede en udvidelse af a. poplitea med en tilhørende trombe og et hæmatom, der målte 2,9 x 2,7 cm på tværs og strakte sig 15 cm i længden (Fig. 1).

Efterfølgende CT-angiografi af begge underekstremiteter bekræftede mistanken om et aneurisme af a. politea på venstre ben med arteriel trombose. Der blev også påvist et aneurisme af a. politea på højre ben, hvor der ikke var beskrevet symptomer (Fig. 2).

Patienten blev opereret i karkirurgisk regi dagen efter med en vendt venebypass på venstre underekstremitet. Der var efterfølgende ikke indikation for operation af højre underekstremitet.

Figur 1. Ultralyd venstre underekstremitet i knæhase: aneurisme a. poplitea med mural trombe (markeret med rød cirkel)



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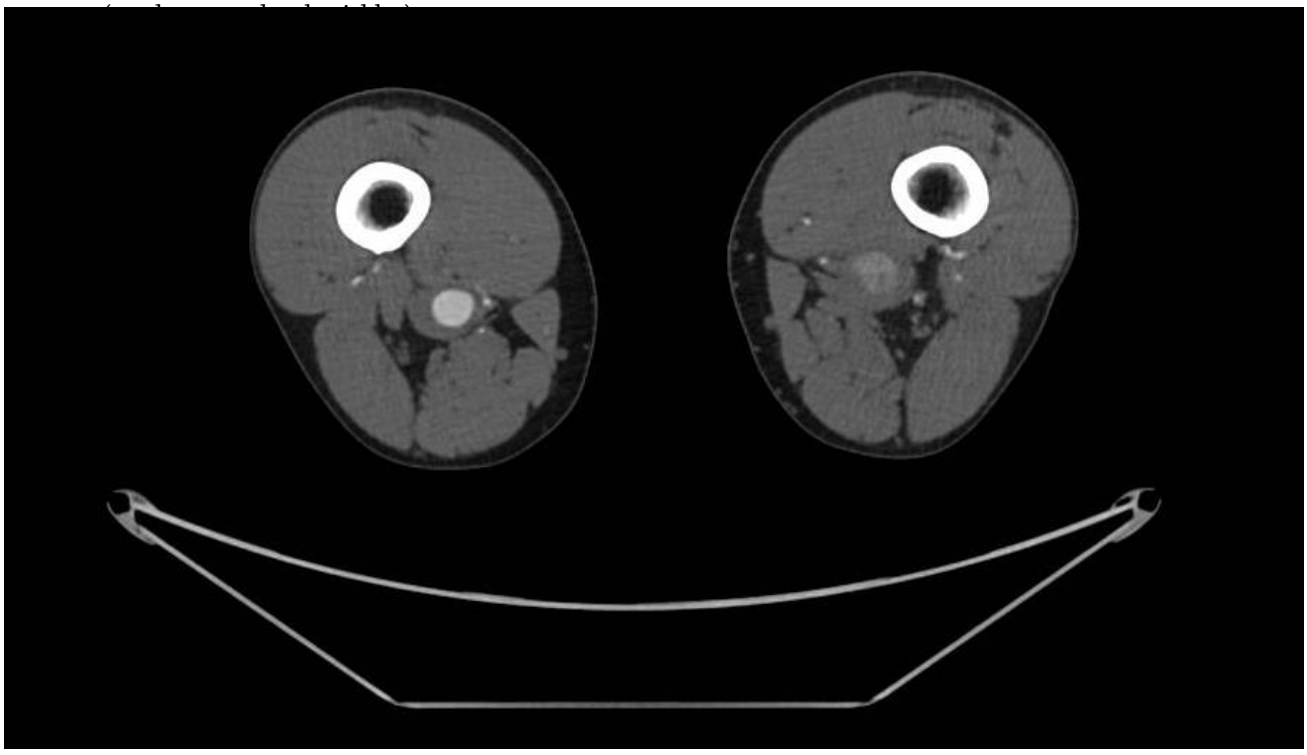
Omkring 97% af patienter, der udvikler popliteaaneurismer, er mænd. Forekomsten af popliteaaneurismer rapporteres at være 7,4 per 100.000 hos mænd og 1 per 100.000 hos kvinder. Bemærkelsesværdigt er der, når der påvises et popliteaaneurisme på det ene ben, en sandsynlighed på 54% for, at der også er et aneurisme på det modsatte ben. Der er også en betydelig øget risiko for aortaaneurisme, der varierer fra 40% til 70%, afhængigt af om der er unilaterale eller bilaterale popliteaaneurismer [Sidawy, AN, Perler BA. Rutherford's Vascular Surgery and Endovascular Therapy, 2-Volume Set, E-Book, Elsevier Health Sciences; 2022. https://doi.org/10.1016/S0140-6736(23)00462-2]. Der er kun publiceret få review artikler angående popliteaaneurismer i de sidste år, de fleste i sammenhænge med andre kasuistikker [Verikokos C, Karaolanis G, Doulaptsis M, et al. Giant popliteal artery aneurysm: case report and review of the literature. Case Rep Vasc Med. 2014;2014:780561. doi:10.1155/2014/780561] [Cecenarro RR, Allende JN, Barreras Molinelli L, Antueno FJ, Gramática L. Popliteal Artery Aneurysms: Literature Review and presentation of case. Rev Fac Cien Med Univ Nac Cordoba. 2018;75(1):41-45. Published 2018 Mar 29. doi:10.31053/1853.0605.v75.n1.16097].

Popliteaaneurismer kan identificeres som en asymptomatisk pulserende udfyldning bag knæet. Symptomer ses relativt sjældent ved diameter < 2,6-3 cm. Manglende fodpulse ved asymptomatisk aneurisme er et tegn på øget risiko for komplikationer.

Figur 2. CT angiografi underekstremiteter på knæhase niveau: bilateral aneurisme a. poplitea, med trombosering



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Den vanligste komplikation er akut eller kronisk iskæmi, enten forårsaget af trombose af selve aneurismet eller embolisering til cruskarene. Akut iskæmi medfører høj risiko for amputation.

Kompressionssymptomer ses hos en minoritet. Symptomerne omfatter smerter og tryk bag knæet, hævelse af benet distalt for aneurismet, eller endog trombose af vena poplitea, der bliver komprimeret. Dropfod på grund af kompression af nervus peroneus er også beskrevet [Sidawy, AN, Perler BA. Rutherford's Vascular Surgery and Endovascular Therapy, 2-Volume Set, E-Book, Elsevier Health Sciences; 2022. https://doi.org/10.1016/S0140-6736(23)00462-2].

Ruptur er en meget sjælden komplikation, der ses hos 0-7 % af patienter diagnosticeret med popliteaaneurisme.

I kasuistikken indikerede patientens symptomer mere klassisk claudicatio end DVT, men henvisningen til akutafdelingen blev alligevel sendt med mistanke om det sidstnævnte. Denne sag understreger vigtigheden af den differentialdiagnostiske tankegang og potentialet for atypiske præsentationer af vaskulære patologier.

Hvordan kan case reporten bruges i danske akutmodtagelser?

- Overvej sjældne årsager til en dyb venetrombose, hvis præsentationen ikke er klassisk.

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