

Enhancing Sepsis Detection: Implementing the TeSD-IT Score in Primary Care-A Qualitative Study

Name: Bryce Renkema

Student number: 6107893

Supervisor: Dr. R.P. Venekamp

Division: Julius Centre for Health Sciences and Primary Care

Internship period: 8 April 2024 – 28 June 2024

Word count: 3714

ABBREVIATIONS

GP: general practitioner

qSOFA: quick Sepsis Related Organ Failure Assessment

NEWS: National Early Warning Score

N: number

IQR: interquartile range

TeSD-IT: Testing for Sepsis in primary care: Diagnostic and prognostic study Investigating the potential benefits of point of care Testing

FG: focus group interview

I: individual interview

ABSTRACT

Background	Timely recognition and intervention in sepsis are crucial for preventing morbidity and mortality. The TeSD-IT sepsis score aims to enhance sepsis detection in primary care.
Objective	This study aims to explore perspectives and experiences of general practitioners and their drivers regarding the use and implementation of the TeSD-IT score in out-of-hours primary care.
Method	The research group developed a semi-structured topic guide, based on literature and expert opinions. Interviews are conducted, recorded anonymously, transcribed verbatim, and analyzed using thematic analysis.
Results	This qualitative study includes two focus group interviews, one with general practitioners and one with drivers, as well as five individual interviews with general practitioners. Participants find the TeSD-IT score practical and simple to use. It increases awareness of sepsis and aids clinical judgment. However, its influence on clinical policy varies. Challenges identified by GPs include the need to increase awareness and facilitate consistent use of the score.
Conclusions	The TeSD-IT score demonstrates potential as a simple and practical tool for identifying sepsis in out-of-hours primary care. Its ease of use and compatibility with existing routines make it a feasible addition to current care practices. However, successful implementation will require strategies in raising awareness and facilitating widespread adoption.

INTRODUCTION

Sepsis is a life-threatening condition characterized by organ dysfunction due to a dysregulated host response to an infection. Recognized as a global health crisis by the World Health Organization in 2017, sepsis affects over 48 million annually, resulting in 11 million deaths worldwide.¹ Research in the United States attributes 35% of in-hospital deaths to sepsis.² Incidence of sepsis is expected to increase in Western countries due to ageing population.^{3,4} This results in increased disease burden and major healthcare costs. Recent research estimates cumulative costs of sepsis ranging between 3.1 and 6.5 billion euros annually in the Netherlands.^{5,6}

Timely recognition of sepsis and intervention are essential in preventing morbidity and mortality.^{7,8} Hospitals employ clinical warning scores such as the quick Sepsis Related Organ Failure Assessment (qSOFA) and the National Early Warning Score

(NEWS) to optimize detection. The qSOFA is the simplest tool, however it lacks sensitivity.⁹⁻¹³ The NEWS score is more sensitive, with research stating it can reduce sepsis related mortality by 1%.¹⁴ However, it is more complicated in usage and therefore unsuitable for primary care.

In the Netherlands, out-of-hours primary care is facilitated by general practitioner (GP) cooperatives, so as to secure easily accessible care at all times. Patients have the option of visiting the healthcare facility for consultation or receiving a home visit from the GP, if their condition warrants it. During home visits, GPs are often accompanied by drivers, who frequently monitor vital signs.¹⁵ Notably, nearly half of intensive care unit sepsis patients are initially seen by GPs.¹⁶ Despite these numbers, the lack of standardized tools for sepsis in primary care delays pre-hospital diagnosis and treatment.¹⁶⁻¹⁹ Thus, there is a clear need for easier sepsis recognition tools in primary care, prompting

the development of the 'Testing for Sepsis in primary care: Diagnostic and prognostic study Investigating the potential benefits of point of care Testing' (TeSD-IT) score. The TeSD-IT score utilizes six readily available parameters to assess likelihood of sepsis and need for hospital referral (see tables 1 and 2). The TeSD-IT score is more simple in use and calculations than the NEWS, and utilizes variables typically already measured by GPs or their drivers.²⁰

Table 1: TeSD-IT score parameters

TeSD-IT sepsis score	
Age > 65 years	1 point
Temperature > 38°C	1 point
Systolic blood pressure ≤ 110 mmHg	1 point
Heart rate > 110/min	1 point
Peripheral oxygen saturation ≤ 95%	1 point
Altered consciousness	1 point

Successful implementation of a new clinical tool hinges on the acceptance and integration by frontline healthcare providers.^{21,22} Furthermore, formulating a strategy for implementation, as well as identifying facilitators and needs, improves uptake of use.^{23,24}

This study aims to explore the perspectives of GPs and their drivers on using and implementing the TeSD-IT score in out-of-hours primary care.

Table 2: Interpretation of TeSD-IT score results

TeSD-IT score results	
0-1 points, low risk (3%)	No emergency department referral for suspected sepsis
2-3 points, moderate risk (29%)	Consider emergency department referral if there are signs of sepsis or there is diagnostic uncertainty
4-6 points, high risk (76%)	Direct emergency department referral advised

METHODS

Study design and setting

This qualitative study is part of a larger mixed method study researching the feasibility and acceptability of the TeSD-IT score, which has not yet been published. The quantitative findings of this study are reported separately. In summary, this mixed methods study is conducted with GPs scheduled to make home visits to an acutely ill patient. During these visits, the GPs utilize the TeSD-IT score to assess the likelihood of sepsis and provide a recommendation for hospital referral. However, the ultimate decision to refer remains with the GP. Afterwards, GPs are invited to complete a survey exploring how the TeSD-IT score influenced their decision-making. This qualitative study invites GPs and their drivers to expand on their experiences and perspectives on using the TeSD-IT score.

Participant selection

Participants are recruited from the cohort of GPs who used the TeSD-IT scoring system during a pilot study. All eligible GPs are approached for participation, no exclusion criteria are applied.

Data collection

Data is gathered through both focus-group interviews and individual interviews. All interviews follow a semi-structured format, allowing

participants to accentuate and elaborate on topics they find important. Probing questions are used to elicit further insights and clarify responses when necessary. Prior to data collection, the research team developed a semi-structured topic guide (see Appendix A) informed by literature and expert opinions. The topic guide explores the usability and implementation of the test.

Data analysis

Interviews are recorded anonymously and transcribed verbatim. Transcripts are imported into NVivo (release 14.23.1) for analysis. Initially, a presumptive coding scheme is established based on the topic guide developed by the research team. This codebook evolves throughout the analyzing process, incorporating emergent themes identified through iterative review of transcripts and data analysis.

RESULTS

Two focus group interviews (FG) are conducted, the first with drivers (FG 1; n=4), the second with GPs (FG 2; n=3). All five individual interviews (I 1-5) are conducted with GPs. For an overview of baseline characteristics see table 3.

In the following paragraphs, opinions are reported on four themes: perspectives on sepsis, practical use, reliability score, and future perspectives. Quotations contributing to interpretation of these

themes are implemented in the text, and displayed in table 4.

Table 3: Participant demographics (n=12)

	Frequency
Occupation, n (%)	
General practitioner	8 (67)
Driver	4 (33)
Sex general practitioners, n (%)	
Male	2 (25)
Sex drivers, n (%)	
Male	4 (100)
Times score was used by GPs (n)	
Median (IQR)	4.5 (1.0-7.0)
General practitioner work experience (years)	
Median (IQR)	10.5 (0.1-28.0)
Length of interviews (minutes)	
Median (IQR)	25.0 (15.0-29.0)

N: number, IQR: interquartile range

Theme 1: perspectives on sepsis

The first theme focuses on GPs' current perception of sepsis. It is categorized in the following subthemes: intuitive approach and clinical cues in sepsis diagnosis, and daily practice challenges and collaborative approach.

Intuitive Approach and Clinical Cues in Sepsis

Diagnosis GPs rely on their clinical intuition, often described as a "gut feeling", when diagnosing sepsis. As one GP states, "As a GP, you usually work very intuitively" (I 2, GP), and another acknowledges that making the diagnosis "is, of course, always a bit intuitive" (I 3, GP). Additionally, objective measurements are also utilized. All parameters included in the TeSD-IT score were named by GPs as ways they substantiate their clinical suspicion of sepsis. Other named signs and symptoms that raise concerns about sepsis are rapid progression of symptoms, concerned family, and the patient's frailty. While respiratory rate was mentioned as a relevant parameter by some GPs, there was discussion surrounding its accurate assessment. One GP describes the following, "And the respiratory rate, are you very strict about that, because I have to say that, honestly.... I should count that more often if I were to look at myself." (FG 2, GP)

This subtheme highlights the interplay between GPs' intuitive clinical judgment and the consideration of objective measurements, including those incorporated in the TeSD-IT score, when diagnosing sepsis. However, there was recognition of potential variability in the assessment of certain parameters, such as respiratory rate.

Daily Practice Challenges and Collaborative Approach

Participants acknowledge that diagnosing sepsis in daily practice can be challenging, as symptoms can be misleading, and patients may deteriorate rapidly. As a result, GPs feel that sepsis is often underdiagnosed in primary care settings, as one GP states: "we all know that it [sepsis] is missed a lot in primary care" (I 4, GP).

While severe cases of sepsis are generally easier to recognize, patients presenting with more vague symptoms pose significant diagnostic difficulties. Additionally, participants highlight that early warning signs are often overlooked, especially in elderly patients. Despite these challenges, GPs did not express feeling overly anxious about diagnosing sepsis.

The importance of interprofessional teamwork is emphasized as a crucial aspect of managing sepsis cases. One GP highlights, "Look, sepsis is really a diagnosis that you make together. This is precisely the kind of thing where you work with multiple partners in a healthcare chain, and together you have to ensure that the faster the patient gets to the hospital, the better his outcomes are" (I 5, GP).

Theme 2: practicality

This theme highlights the experiences of GPs regarding the practical usability of the score, which is paramount in understanding the feasibility of using the score. The theme comprises two subthemes: user-friendly yet time-constrained implementation, and varied timing of score utilization and the role of reminders.

User-Friendly Yet Time-Constrained Implementation Both GPs and drivers acknowledge the user-friendly nature of the TeSD-IT score. GPs emphasize its practicality and simplicity, as one GP notes, "what helps is that these are generally parameters that we already collect anyway" (I 1, GP). Drivers corroborate this sentiment, adding that the score does not increase their workload. They further state that GPs are accustomed to using various lists and scores, suggesting that incorporating the TeSD-IT score should not significantly disrupt their routine. However, despite the score's straightforward design, participants underscore the need for GPs to familiarize to its use, particularly during time-constrained home visits. As one GP highlights, "There is no time to sit down and think: what have we got here? That is another objection to this score, that there are actually few moments when you can fill it in. So it has to be sufficiently easy, that it can be used during the physical examination." (I 2, GP).

Varied Timing of Score Utilization and the Role of Reminders The timing of utilizing the TeSD-IT score during consultations varies among GPs. Two distinct approaches emerge: some GPs use the score concurrently, calculating it to inform and potentially modify their clinical decision-making. This aligned with the intended use of the score as a real-time support tool. In contrast, other GPs calculate the score after completing a home visit, comparing the result retrospectively to their clinical decision. GPs identify several factors that facilitate the use of the score during consultations, rather than afterwards. These include being reminded by drivers, knowing the score by heart, and consistent use over time. Drivers acknowledge their role in prompting and motivating GPs to calculate the score. When asked if GPs would consistently fill out the score without driver reminders, one driver responds: "I think much less so. It's often that I also said, when we went back to the hospital: 'don't forget to fill in the list!' [...] You know, you do have to chase them because otherwise I don't think it happens consistently" (FG 1, driver).

Theme	Subtheme	Quotations
1. Perspectives on sepsis	1.1 Intuitive Approach and Clinical Cues in Sepsis Diagnosis	<p>"Always of course fever, blood pressure, heart rate, overall... What does someone look like. Consciousness." (FG 2, GP)</p> <p>"... and the course of the illness, meaning how quickly it progresses, I always find important. That is not included in this score. And actually, I always consider a person's frailty as well. But that's not measurable, is it?" (I 2, GP)</p>
	1.2 Daily Practice Challenges and Collaborative Approach	<p>"That's been my experience though [...] it can catch you off guard like that." (FG 2, GP)</p> <p>"I must say that those times I did see it, someone was also really seriously ill, [...] and then I did recognize it quickly. It is of course more difficult when you are still a bit in that preliminary stage, then you don't recognize it as quickly." (I 5, GP)</p> <p>"Am I not underestimating this situation? Because I think that's exactly [...] with those elderly people, that we do sometimes miss the earlier signs of sepsis. Yes, and then at the next visit, we find a critically ill patient." (I 1, GP)</p> <p>"And, it's kind of funny, because as a general practitioner you don't like to send somebody in just for the numbers, but you actually have to do that with sepsis." (I 2, GP)</p> <p>"I did experience sepsis several times and also thinking back I still sometimes think, didn't I miss something here in those years?" (FG 2, GP)</p>
2. Practical use	2.1 User-Friendly Yet Time-Constrained Implementation	<p>"Especially if you do out-of-hours home visits of course, because then the driver does all these measurements. You check yourself if there is an altered mental state. You just have to fill in the score list in your head, and then you have it. So that does work very practically." (I 4, GP)</p> <p>"Because he [the score] was certainly simple." (FG 2, GP)</p>

		<p>“While you do have to learn to work with it, it's not a difficult list.” (I 3, GP)</p> <p>“It's practical, yes. Yes very, yes. [Because] actually you know all those things. Then you just list it and give them a value.” (I 2, GP)</p> <p>“No, it [the workload] was not perceived as shocking. And for us it's... The measurements we do anyway.” (FG 1, driver)</p> <p>“GPs, of course, do quite a lot with examinations and so on, so they are used to having to fill out lists often.” (FG 1, driver)</p>
	<p>2.2 Varied Timing of Score Utilization and the Role of Reminders</p>	<p>“And I must say that did change a bit over time, because when I first got it I thought, oh another list, what should we do with it? And at a certain point, I started using it and I thought: oh, this is actually quite useful to objectify it a bit more for yourself! Yes, so there was a turning point.” (I 3, GP)</p> <p>“I filled it [the score] out after the home visit, but then I had already made my assessment during the consultation, like: what am I going to do? And then my assessment usually matched what was on the card.” (I 5, GP)</p> <p>“Actually [using the score] is a checklist in your head whilst doing the physical examination, but at least before you go into the policy. So [...] before you determine your policy you determine, is there possibly sepsis?” (I 4, GP)</p>
<p>3. Reliability score</p>	<p>3.1 Perceived Trustworthiness and Sensitivity of the Score</p>	<p>“If you have studied that such a score is a reliable predictor of sepsis... Then I would think: okay, it really becomes worth using that score.” (I 1, GP)</p> <p>“And I was confident that it was also reliable. A few times I did both, but with the SIRS criteria you have to count the respiratory rate. Well, I don't feel like doing that and it's always a bit unreliable. It was the best we had, and not very good. And that's why I started using that score list and it's extraordinarily nice.” (I 4, GP)</p> <p>“Often they would look for one more thing, just to make sure they didn't refer for nothing. Otherwise, in the hospital, you get a name of [...] doctor-I-refer-anything.” (FG 1, driver)</p>
	<p>3.2 Heightened Sepsis Awareness and Influence on Safety-Netting</p>	<p>“But I think the score helps you to have it a bit sharper in the differential diagnosis and maybe give a bit sharper safety-net. With any change, deterioration, don't wait until 8 a.m. the next morning, but also raise the alarm at night, I think.” (FG 2, GP)</p> <p>“It supports your clinical judgment, so it makes your own thoughts more concrete. [...] But, I don't quite dare say that [the score changed my policy].” (I 4, GP)</p> <p>“We just did our job and then filled in that score afterwards. But of course that also meant that in those shifts we actually did not let that score guide our policy at all.” (I 1, GP)</p> <p>“Yes indeed, it [the score] didn't influence it [policy]. No, I didn't calculate it, say, during the visitation, but then afterwards I would fill it out in the car and see what the score was.” (I 5, GP)</p>
<p>4. Future perspectives</p>	<p>4.1 Fostering Awareness and Facilitating Usage</p>	<p>“Well look, of course any GP, or any person, is hard to change. First of all, he has to see the usefulness and necessity of it. So well, usefulness is: it's easier, you can do it with whatever you have in your bag. So that's how you can entice.” (I 4, GP)</p> <p>“If you keep repeating... the power of repetition, because at the beginning you always have resistance, but the tenth time you see the list you think: oh, maybe I should look at it anyway. [...] And</p>

what also helps is indeed trying to point out the added value." (I 3, GP)

"But that, at least for me, is something [...] I can always find, that I don't have to look up a link again in an email somewhere, but that you just know: it's right here." (FG 2, GP)

4.2 Perceived Value and Potential Applications of the Score

"I know that many general practitioners are not very good at it. [...] Ultimately, the clinical judgment is still the most important; everyone relies on that. But for me, working with this just makes it a bit more certain. And even though it is not yet validated, I am willing to use this tool to have a bit more ammunition." (I 4, GP)

"Yes, what might be a nice application is if you integrate it into the ABCD criteria. For example, if you completely fill out the ABCD criteria, which you should ideally do for every sick patient, and if there is also a fever, a sort of sepsis recommendation rolls out." (I 5, GP)

FG: focus group interview, I: individual interview, GP: general practitioner

Theme 3: reliability score

The third theme gives insight into the experienced reliability of the score, split into two subthemes: perceived trustworthiness and sensitivity of the score, and heightened sepsis awareness and influence on safety-netting.

Perceived Trustworthiness and Sensitivity of the Score

GPs find the parameters of the TeSD-IT score to be well-chosen and generally trust the score's outcomes. The results align with their clinical intuition or gut feeling in most cases. However, GPs emphasize the need for clinical validation of the score before widespread implementation.

GPs perceive certain terminology used in the score as confusing, such as "altered mental state", with GPs preferring more straightforward phrasing like "reduced consciousness".

Notably, participants express concerns regarding the score's sensitivity, perceiving it as being too sensitive. One GP states, "When you see those sepsis criteria, they're super strict, I think. As in, you get there pretty quickly: if I then look purely at that score, I often found people on that score to be sicker than I found them in real life" (FG 2, GP). Another GP echoes this sentiment, saying, "Then I almost start to wonder, what did I miss?" (FG 2, GP). However, this concern raises further discussion, as GPs acknowledge that the score's heightened sensitivity might be intentional, with one GP stating, "We often miss it, subconsciously mind you, but if you look purely at the criteria, someone meets them much earlier than we think. [...] We only see the tip of the iceberg" (FG 2, GP).

Drivers mention that in their experience, GPs tend to seek additional reasons to admit a patient to the hospital rather than relying solely on a high sepsis score. This potentially indicates a degree of hesitancy in fully trusting the score's outcome.

Heightened Sepsis Awareness and Influence on Safety-Netting

The use of the TeSD-IT score alters the clinical reasoning of GPs by heightening their awareness of sepsis. This increased awareness leads to sepsis being considered more frequently and prominently in the differential diagnosis.

Among the GPs using the score before deciding on their clinical course of action, the score does not directly influence whether a patient was referred for further care. However, when the score result is higher than initially expected, GPs tend to provide stricter safety-netting advice.

One GP provides an illustrative example, stating: "A visit where I already thought: yes, this definitely needs to be referred, and this [score] confirmed it, so to speak. [...] And another one with a consultation where I was uncertain, but we were still on the good side, so we sent the patient home with good advice" (I 3, GP).

Theme 4: future perspectives

The final theme explores perspectives on the future role of the score in primary care and how this is to be realized. It is categorized in two subthemes: fostering awareness and facilitating usage, and perceived value and potential applications of the score.

Fostering Awareness and Facilitating Usage

GPs acknowledge that drawing attention to the existence of the TeSD-IT score and subsequently persuading GPs to use it will be the biggest challenge in its implementation. They recognize the difficulty in reaching and motivating their colleagues, as one GP states, "Well, I know a lot of my colleagues won't do that, so finding uniformity in that is, I think, the biggest challenge" (I 2, GP).

GPs emphasize the importance of establishing the added value or benefit of using the test as an essential part of facilitating its use. They propose

various strategies to create awareness, such as featuring the score in newsletters, GP journals, or including it in educational programs (see Table 5 for a comprehensive list).

Even if awareness is adequately raised, GPs acknowledge that additional efforts will be needed to encourage actual usage. They suggest making the test easily findable, accessible, and easy to report and document. Furthermore, GPs state that for seamless handover and continuity of care, the score should be used throughout the entire healthcare chain, enabling smooth transitions to the emergency department and medical specialists. However, this idea is met with contrasting views from other GPs, who argue:

"No, because specialists also think in controls and probabilities, so I haven't experienced any difficulties [with handover and admitting]. Look, they have tools that suit the hospital setting. They should not use the same things that we do, because we just have the primary care toolbox. [...] On the

contrary, I am happy that there is something that we... all 6 criteria we can do in primary care, with that which is in your doctor's bag. Also in day practice. And that's the added value for me" (I 4, GP).

In this study, drivers play a crucial role as motivators for GPs to use the score. GPs highlight the potential of involving drivers in future implementation, as they are part of the primary care team. One GP suggests, "I'm brainstorming wildly right now. But the driver [...] can, of course, be included in such a score list, that driver can also calculate that himself" (I 3, GP). However, concerns are raised about the varying motivations and skillsets of drivers, with one GP stating, "I actually don't think so, because our drivers are quite well trained by us as GPs, but they are really just taxi drivers. So, I don't think you should and can give them that role, but they do measure patient parameters quite often" (I 2, GP).

Table 5: Concrete examples given by GPs and drivers for creating awareness and facilitating usage of the TeSD-IT score

Topic	Examples
1 Awareness of existence	
1.1 Newsletters and journals	Huisarts & Wetenschap®, Nederlands Tijdschrift voor Geneeskunde®, Landelijke Huisartsen Vereniging, out-of-hours primary care service newsletter, UNICUM® newsletter
1.2 Education	General practitioner residency, ABCDE algorithm training, resuscitation training courses, continuing medical education (CME)
1.3 Other	Mailing score to all general practices
2 Facilitating use	
2.1 Findability	NHG guidelines, application for emergency primary care, creating episode in Topicus®
2.2 Education	See 1.2
2.3 Healthcare chain	Using score in handover to ED or medical specialist, mobilizing triage nurses and GP drivers to use score
2.4 Documentation	Pop-up in patient file, automatic calculation when documenting vital parameters, entry field in SBARR forms

Perceived Value and Potential Applications of the Score While all GPs express willingness to use the TeSD-IT score in the future, some have specific requirements before doing so, such as integrating the score within existing systems. However, opinions vary regarding the necessity of the score, with some GPs stating it would be "nice to have... Not essential" (FG 2, GP).

Several GPs continue using the score even after the study ended, indicating their recognition of the urgency in implementing the score. GPs primarily use the score to support their clinical intuition and maintain awareness of the possibility of sepsis. Additionally, it is suggested that the score could be particularly beneficial for less experienced GPs whose clinical gut feeling is still developing.

One GP highlights this potential value for junior practitioners, stating, "What I have learned from that score is to make it [gut feeling] more objective, so I think that is the great positive aspect of that score, especially for new doctors who still need to gain experience and learn to recognize that uneasy feeling... it has a significant added value for that" (I 3, GP).

DISCUSSION

Summary

This study analyzes opinions on using and implementing the TeSD-IT score in out-of-hours primary care, as experienced by GPs and their drivers. In summary, the TeSD-IT sepsis score is seen as practical and easy to use. As GPs often rely on intuition to diagnose sepsis, the score supports their

gut feeling. Furthermore, the score raises awareness of sepsis diagnosis, and assists less experienced practitioners. However, the necessity of the score is debated. Challenges include timely application, raising awareness and facilitating use. GPs emphasize the importance of the score being easily accessible and integrated into existing systems to ensure widespread adoption.

Strengths and limitations

A key strength of this study lies in the data triangulation achieved by gathering perspectives from different stakeholders and employing complementary data collection methods. Insights were obtained from both GPs and drivers, capturing diverse viewpoints integral to the implementation and use of the TeSD-IT score. Furthermore, the combination of individual in-depth interviews and focus group discussions fosters a rich exploration of the topic. This triangulation of data sources and methods enhanced the credibility and comprehensiveness of the findings.

The results of this paper are to be placed within context of certain limitations. The response rate is relatively low, which may introduce potential selection bias and limit the transferability of the findings. Despite efforts to recruit a diverse sample, the views and experiences captured may not fully reflect the diverse spectrum of perspectives among GPs and drivers. Furthermore, this pilot study had a relatively short duration time, and the experiences of GPs using the score may evolve with more frequent usage over an extended period of time. Lastly, this study was conducted in the Netherlands. Due to variations in healthcare organization across countries, the results may have limited applicability to international healthcare systems.

Comparison with existing literature

There is limited research on the implementation of warning scores for conditions like sepsis or other clinical risk scores. Van der Heiden et al.²⁵ explores GPs' experiences and views on implementing lifestyle interventions in primary care in the Netherlands. Participants emphasize the importance of establishing the added value of a new score and achieving a sense of urgency. They also underscore the necessity for clinical validation before implementing a new intervention or scoring system. Brangan et al.²⁶ explore British healthcare workers' perspectives on implementing the NEWS score. Participants note that the NEWS tool supports their clinical judgment and intuition, although patient context remains crucial. Less experienced staff members tend to rely more on the scoring system for guidance, while more experienced staff members view it as a

supplementary tool rather than a definitive decision-maker. Furthermore, Brangham et al. underscore the importance of integrating the NEWS score throughout the healthcare chain to facilitate smoother patient handovers. Interestingly, GPs are identified as the most challenging group to integrate the NEWS score. Despite the TeSD-IT score being simpler than the NEWS, and tailored for primary caregivers, this observation highlights the challenge of reaching these healthcare professionals. A qualitative research study²⁷ and literature review²⁸ on effectively implementing changes in healthcare systems confirm that achieving change can be challenging within primary care settings. However, creating an implementation strategy in consultation with key stakeholders proves helpful.²⁸

Implications for future research and practice

Timely recognition and intervention in sepsis are crucial for preventing morbidity and mortality. The TeSD-IT sepsis score aims to enhance sepsis detection in primary care. This study shows that GPs find the TeSD-IT score user-friendly and practical. Furthermore, this study shows widespread adoption could benefit from creating awareness about the score's existence, emphasizing its added value, and facilitating its usage by supporting GPs in performing the measurements and reminding them to use the score. Lastly, for implementation to be successful, primary caregivers need to be educated on the importance of early recognition of sepsis, and the TeSD-IT score should preferably be known throughout the entire healthcare chain to ensure smooth handovers.

Further research on this subject would benefit from an extended study duration and a more comprehensive approach, ensuring that GPs use the TeSD-IT score more frequently and over a longer period of time. Additionally, future research should focus on clinically validating the TeSD-IT score.

CONCLUSIONS

In conclusion, the TeSD-IT score shows promise as a simple and practical tool for identifying sepsis in out-of-hours primary care in the Netherlands. Its ease of use and alignment with existing routines make it a feasible addition to care practices. However, successful implementation will require addressing challenges in creating awareness and facilitating usage. Further research should be focused on clinically validating the TeSD-IT sepsis score.

REFERENCES

1. World Health Organization. Sepsis. [Internet]. Available from: <https://www.who.int/news-room/fact-sheets/detail/sepsis>. [Accessed June 2nd 2024].
2. Rhee C, Jones TM, Hamad Y, Pande A, Varon J, O'Brien C, et al. Prevalence, underlying causes, and preventability of sepsis-associated mortality in US acute care hospitals. *JAMA Netw Open*. 2019 Feb 1; 2(2): e187571.
3. Suarez De La Rica A, Gilsanz F, Maseda E. Epidemiologic trends of sepsis in western countries. *Ann Transl Med*. 2016 Sep;4(17):325. doi: 10.21037/atm.2016.08.59. PMID: 27713883.
4. Macdonald SP, Williams JM, Shetty A, Bellomo R, Finfer S, Shapiro N, et al. Review article: Sepsis in the emergency department - Part 1: Definitions and outcomes. *Emerg Med Australas*. 2017 Dec;29(6):619-625. doi: 10.1111/1742-6723.12886. PMID: 29094474.
5. Luijckx ECN, van der Slikke EC, van Zanten ARH, Ter Maaten JC, Postma MJ, Hilderink HBM, et al. Societal costs of sepsis in the Netherlands. *Crit Care*. 2024 Jan 22;28(1):29. doi: 10.1186/s13054-024-04816-3. PMID: 38254226.
6. van den Berg M, van Beuningen FE, Ter Maaten JC, Bouma HR. Hospital-related costs of sepsis around the world: A systematic review exploring the economic burden of sepsis. *J Crit Care*. 2022 Oct;71:154096. doi: 10.1016/j.jcrc.2022.154096. PMID: 35839604.
7. Rhodes A, Phillips G, Beale R, Cecconi M, Chiche JD, De Backer D, et al. The Surviving Sepsis Campaign bundles and outcome: results from the International Multicentre Prevalence Study on Sepsis (the IMPReSS study). *Intensive Care Med*. 2015 Sep;41(9):1620-8. doi: 10.1007/s00134-015-3906-y. PMID: 26109396.
8. Singer M, Deutschman CS, Seymour CW, Shankar-Hari M, Annane D, Bauer M, et al. The Third International Consensus Definitions for Sepsis and Septic Shock (Sepsis-3). *JAMA*. 2016 Feb 23;315(8):801-10. doi: 10.1001/jama.2016.0287. PMID: 26903338.
9. Jiang J, Yang J, Mei J, Jin Y, Lu Y. Head-to-head comparison of qSOFA and SIRS criteria in predicting the mortality of infected patients in the emergency department: a meta-analysis. *Scand J Trauma Resusc Emerg Med*. 2018 Jul 11;26(1):56. doi: 10.1186/s13049-018-0527-9. PMID: 29996880.
10. Shu E, Ives Tallman C, Frye W, Boyajian JG, Farshidpour L, Young M, et al. Pre-hospital qSOFA as a predictor of sepsis and mortality. *Am J Emerg Med*. 2019 Jul;37(7):1273-1278. doi: 10.1016/j.ajem.2018.09.025. Epub 2018 Sep 18. PMID: 30322666.
11. Song JU, Sin CK, Park HK, Shim SR, Lee J. Performance of the quick Sequential (sepsis-related) Organ Failure Assessment score as a prognostic tool in infected patients outside the intensive care unit: a systematic review and meta-analysis. *Crit Care*. 2018 Feb 6;22(1):28. doi: 10.1186/s13054-018-1952-x. PMID: 29409518.
12. Qiu X, Lei YP, Zhou RX. SIRS, SOFA, qSOFA, and NEWS in the diagnosis of sepsis and prediction of adverse outcomes: a systematic review and meta-analysis. *Expert Rev Anti Infect Ther*. 2023 Jul-Dec;21(8):891-900. doi: 10.1080/14787210.2023.2237192. PMID: 37450490.
13. Oduuncu AF, Kıyan GS, Yalçınlı S. Comparison of qSOFA, SIRS, and NEWS scoring systems for diagnosis, mortality, and morbidity of sepsis in emergency department. *Am J Emerg Med*. 2021 Oct;48:54-59. doi: 10.1016/j.ajem.2021.04.006. PMID: 33839632.
14. Pullyblank A, Tavaré A, Little H, Redfern E, le Roux H, Inada-Kim M, et al. Implementation of the National Early Warning Score in patients with suspicion of sepsis: evaluation of a system-wide quality improvement project. *Br J Gen Pract*. 2020 May 28;70(695):e381-e388. doi: 10.3399/bjgp20X709349. Erratum in: *Br J Gen Pract*. 2022 Dec 21;73(726):11. doi: 10.3399/bjgp23X731565. PMID: 32269043.
15. Smits M, Rutten M, Keizer E, Wensing M, Westert G, Giesen P. The Development and Performance of After-Hours Primary Care in the Netherlands: A Narrative Review. *Ann Intern Med*. 2017 May 16;166(10):737-742. doi: 10.7326/M16-2776. PMID: 28418455.
16. Loots FJ, Smits M, van Steensel C, Giesen P, Hopstaken RM, van Zanten ARH. Management of sepsis in out-of-hours primary care: a retrospective study of patients admitted to the intensive care unit. *BMJ Open*. 2018 Sep 17;8(9):e022832. doi: 10.1136/bmjopen-2018-022832. PMID: 30224394.
17. Groenewoudt M, Roest AA, Leijten FM, Stassen PM. Septic patients arriving with emergency medical services: a seriously ill population. *Eur J Emerg Med*. 2014 Oct;21(5):330-5. doi: 10.1097/MEJ.000000000000091. PMID: 24185258.
18. van der Wekken LC, Alam N, Holleman F, van Exter P, Kramer MH, Nanayakkara PW. Epidemiology of Sepsis and Its Recognition by Emergency Medical Services Personnel in the Netherlands. *Prehosp Emerg Care*. 2016;20(1):90-6. doi: 10.3109/10903127.2015.1037476. PMID: 26024065.
19. Latten G, Hensgens K, de Bont E, Muris J, Cals J, Stassen P. How well are sepsis and a sense of urgency documented throughout the acute care chain in the Netherlands? A prospective, observational study. *BMJ Open*. 2020 Jul 19;10(7):e036276. doi: 10.1136/bmjopen-2019-036276. PMID: 32690518.
20. Loots FJ, Smits M, Hopstaken RM, Jenniskens K, Schroeten FH, van den Bruel A, et al. New clinical prediction model for early recognition of sepsis in adult primary care patients: a prospective diagnostic cohort study of development and external validation. *Br J Gen Pract*. 2022 May 26;72(719):e437-e445. doi: 10.3399/BJGP.2021.0520. PMID: 35440467.
21. Teuscher D, Bukman AJ, van Baak MA, Feskens EJM, Renes RJ, Meershoek A. A lifestyle intervention study targeting individuals with low socioeconomic status of different ethnic origins: important aspects for successful implementation. *BMC Public Health*. 2017 Jul 25;18(1):54. doi: 10.1186/s12889-017-4592-1. Erratum in: *BMC Public Health*. 2017 Sep 22;17(1):736. doi: 10.1186/s12889-017-4709-6. PMID: 28743281.
22. Fischer F, Lange K, Klose K, Greiner W, Kraemer A. Barriers and Strategies in Guideline Implementation-A Scoping Review. *Healthcare (Basel)*. 2016 Jun 29;4(3):36. doi: 10.3390/healthcare4030036. PMID: 27417624.
23. Carlford S, Lindberg M, Bendtsen P, Nilsen P, Andersson A. Key factors influencing adoption of an innovation in primary health care: a qualitative study based on implementation theory. *BMC Fam Pract*. 2010 Aug 23;11:60. doi: 10.1186/1471-2296-11-60. PMID: 20731817.
24. Carlford S, Andersson A, Nilsen P, Bendtsen P, Lindberg M. The importance of organizational climate and implementation strategy at the introduction of a new working tool in primary health care. *J Eval Clin Pract*. 2010 Dec;16(6):1326-32. doi: 10.1111/j.1365-2753.2009.01336.x. PMID: 20738475.
25. van der Heiden W, Lacroix J, Moll van Charante EP, Beune E. GPs' views on the implementation of combined lifestyle interventions in primary care in the Netherlands: a qualitative study. *BMJ Open*. 2022 Feb 4;12(2):e056451. doi: 10.1136/bmjopen-2021-056451. PMID: 35121605.

26. Brangan E, Banks J, Brant H, et al. Using the National Early Warning Score (NEWS) outside acute hospital settings: a qualitative study of staff experiences in the West of England. *BMJ Open* 2018; 8(10): e022528.
27. Holtrop JS, Potworowski G, Fitzpatrick L, Kowalk A, Green LA. Understanding effective care management implementation in primary care: a macrocognition perspective analysis. *Implement Sci.* 2015 Aug 21;10:122. doi: 10.1186/s13012-015-0316-z. PMID: 26292670.
28. Grol R, Grimshaw J. From best evidence to best practice: effective implementation of change in patients' care. *Lancet.* 2003 Oct 11;362(9391):1225-30. doi: 10.1016/S0140-6736(03)14546-1. PMID: 14568747.

APPENDIX A TOPIC GUIDE

1. Relevantie van de aandoening sepsis en het gebruik van de sepsis score

- *Ervaringen met sepsis als huisartsen gedurende visitediensten:*
 - Hoe zou je je algemene ervaring beschrijven bij het omgaan met patiënten die mogelijk sepsis hebben tijdens visitediensten?
 - Kun je specifieke voorbeelden delen van situaties waarin je sepsis vermoedde tijdens een huisbezoek?
 - Op welke signalen en symptomen let je met name bij het vermoeden van sepsis tijdens visitediensten?
 - Vervolgstappen bij herkenning van sepsis?
 - Welke stappen ondernemen jullie doorgaans bij sepsis? Vinden jullie specifieke vervolgstappen moeilijker uit te voeren dan anderen?
- *Relevantie van de sepsis score (Bewustwording):*
 - Hoe geschikt vinden jullie de sepsis score in vergelijking met hoe vroeger de diagnose sepsis werd overwogen?
 - Zorgt het gebruik van de sepsis score ervoor dat jullie de diagnose sepsis vaker overwegen?
 - Hoe beoordelen jullie de bruikbaarheid van de sepsis score in het algemeen?

2. Algemeen beeld over het gebruik van de score:

- *Ervaringen tijdens visite diensten:*
 - Hoe hebben jullie de score gebruikt?
 - Op welke manier is de score aangeboden? (score duidelijk uitgelegd inde info brief en door de studenten) (was het voldoende duidelijk hoe de score te gebruiken)
 - *Informatie brief*
 - *Mondelinge informatie*
 - Hoe is jullie ervaring met het gebruik van de sepsis score geweest tijdens de visite diensten?
 - *Attitude*
 - *Risico vermindering*
 - *Gebruiksgemak*
 - *Leercurve*
 - In hoeverre hebben jullie vertrouwen in de uitslag van de score?
 - *Laag score geen sepsis*
 - *Hoog score wel sepsis*
 - Op welke momenten/fase van het consult én om welke redenen hebben jullie besloten de sepsis score te gebruiken?
 - Kan iemand hiervan een concreet voorbeeld geven
 - We zien dat gedurende de drie maanden van de studie geleidelijk minder onderzoek formulieren werden ingevuld.
 - Is dit in jullie ervaring ook zo?
 - Heeft dit in jullie beleving te maken met afname van gebruik van de score of alleen het minder vaak invullen van de onderzoek formulieren?

3. Impact op het beleid:

- *Invloed op het beleid:*
 - Op welke manier heeft het resultaat van de score een invloed op de beslissing om wel of niet te verwijzen?
 - Lage of hoge score sepsis
- *Aanpassingen tijdens het onderzoek:*
 - Is de routine van het beoordelen van patiënten met klachten die kunnen passen bij sepsis gedurende het onderzoek veranderd?

4. Intentie tot gebruik na de studie:

- *Praktische bruikbaarheid in de toekomst:*
 - Zouden jullie deze score zelf gebruiken in de toekomst?
 - Waarom wel/niet?
 - Hoe zien jullie de praktische bruikbaarheid van de sepsis score in de toekomst?
 - Gebruik tijdens visite (setting zoals in het onderzoek)
 - Gebruik algemeen bij alle patiënten (consulten/ visites in eigen praktijk)
 - Wat kunnen jullie aan elkaar vertellen over hoe je deze score kan gebruiken?
 - Kan je ons vertellen welke ondersteuning je nog nodig zou hebben om de implementatie te verbeteren?
 - Kan je ons vertellen welke ondersteuning anderen zeker nodig zullen hebben?