

Sepsis in General Practice: experience and attitudes regarding Early Warning Scores

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Abstract

Aims

To explore General Practitioner (GP) knowledge and experience of sepsis and their attitudes toward the implementation of Early Warning Score (EWS) tools in general practice. Early Warning Scores are clinical scoring systems that combine vital signs to detect early signs of patient deterioration and prompt timely medical intervention. As General Practitioners (GP) are usually the first point of contact for unwell patients, the use of EWSs in General Practice requires exploration.

Methods

A qualitative study design based on the Theoretical Domains Framework using semi-structured interviews with GPs in the Republic of Ireland was used.

Results

Interviews were facilitated with eight GPs. Four dominant domains were identified: Knowledge, Skills, Beliefs about Consequences and Environmental Context and Resources. All participants had knowledge of sepsis and EWSs, and those who used it found it beneficial in supporting clinical decision-making.

Conclusion

GPs in this study demonstrated knowledge and experience related to sepsis. Attitudes towards the potential for use of EWSs in primary care were mixed however some participants were already using informal systems to identify risk of sepsis. Currently no EWS is validated for use in primary care. Research into the use of EWSs for primary care is needed.

Introduction

Sepsis is a life-threatening condition and a major burden on public health and the economy¹. Sepsis is defined as “organ dysfunction caused by a dysregulated host response to infection” (page 2),² with long and short-term consequences including, organ damage, cognitive dysfunction, and death³. Early and accurate diagnosis and prompt treatment are essential when it comes to improving patient outcomes⁴. There were 9,412 cases of sepsis and 1,967 cases of septic shock documented in Ireland in 2024. This demonstrates a 25.4% decrease in reported sepsis cases and a 2.7% increase in reported septic shock cases respectively. *“There was a 21.7% decrease in documented cases of Sepsis and Septic Shock with a 5.8% relative increase in associated in-hospital crude mortality”* (page 9),⁵. Sepsis mortality in the United Kingdom is reported at 20.3%⁶.

Early Warning Scores (EWSs) are used in all acute hospitals in Ireland. EWSs were developed for use in this setting to help recognise and support response to a deteriorating patient, as they promote early detection of deterioration and early medical review and include a definitive escalation plan⁷. The use of EWSs in the pre-hospital setting is associated with faster medical review and poorer clinical outcomes in these patients⁸ and may support decision making related to escalation of care⁹.

Diagnosis of sepsis is challenging due to presenting symptoms that are frequently non-specific¹⁰. In addition, GPs can see patients early in the pathophysiological process of sepsis which further complicates timely diagnosis. The Irish national clinical sepsis programme has implemented a structured identification process, supported by the Irish National Early Warning System (INEWS 1 and 2)¹¹, and management guidelines for acute, maternity, and paediatric settings^{12, 13}. Recent sepsis guidance has been provided for those working in primary care for Adult¹⁴ and Paediatric Sepsis¹⁵ by the Irish College of General Practitioners.

Over 80% of sepsis cases are estimated to result from community-acquired infection¹⁶. The use of EWS in general practice could support early identification of sepsis, leading to improved patient outcomes, by building on standard practice of taking observations to support clinical judgement however currently there is a lack of supportive evidence and a validated tool to support implementation in general practice¹⁷.

This research explored GPs’ knowledge and experience of sepsis and their attitudes toward the implementation of EWS tools in general practice.

Methods

This descriptive qualitative study utilised semi-structured interviews supported by the Theoretical Domains Framework (TDF) ¹⁸ with a sample of General Practitioners in Ireland to explore their experiences of sepsis, and attitudes towards the use of an EWS tool in practice. This research is reported in line with the Consolidated Criteria for Reporting Qualitative Research (COREQ) checklist ¹⁹, (Supplemental File 1). GPs were recruited through purposive sampling with support from the Health Service Executive (HSE) GPSEPway Group. This group was formed in 2019 formed under the management of the Office of Planning and Population Health, South Sout-West Hospital Group with the aim of exploring the potential for implementation and evaluation of a sepsis pathway for General Practice in the Group. Recruitment was supported by the GP representative on the Group. Once GPs agreed to participate, a participant information leaflet was shared and signed consent forms were required in advance of interviews. Participants were informed of the researcher's membership of the GPSEPway group. One-to-one semi-structured interviews were conducted by SM with eight GPs working in primary care in Ireland via Microsoft Teams. Initial data analysis was performed (SM) using a thematic content analysis approach ²⁰ and this was repeated by a second researcher (MS) to validate the findings. Author reflexivity is presented in Supplemental File 2.

Results

Participant Characteristics

Eight GPs practicing in the Republic of Ireland were interviewed to explore their knowledge and experience of sepsis and how they would feel about the implementation of an EWS in general practice, (Table 1).

Table 1: *Demographics of interview participants*

Participant	Gender	Years Practicing	Urban/Rural Practice	Single/Multiple Practice	Province
1	Female	<5	Both	Multiple	Connacht
2	Male	5-10	Urban	Multiple	Leinster
3	Male	>20	Urban	Multiple	Munster
4	Female	>20	Urban	Single	Munster
5	Female	>20	Urban	Multiple	Munster
6	Male	<5	Urban	Multiple	Munster
7	Female	5-10	Urban	Multiple	Munster
8	Male	5-10	Urban	Multiple	Munster

Thematic Analysis

22 codes relating to the TDF domains emerged during the analysis of the interviews. These codes and their related interviews are grouped by TDF domain and are summarised in Table 2.

Table 2: Themes Identified and Relevant Interviews

TDF Domain	Themes	Relevant Interviews
Dominant Domains		
Knowledge	Knowledge and experience of sepsis	1, 2, 3, 4, 5, 6, 7, 8
	Knowledge of EWSs	1, 2, 3, 4, 5, 6, 7, 8
Skills	Recognition of sepsis	1, 2, 3, 4, 5, 7, 8
	Escalation of potential sepsis cases	1, 3, 4, 5, 7, 8
Beliefs About Consequences	Positive Beliefs regarding implementation of EWSs into GP Practice	2, 3, 4, 5
	Negative Beliefs regarding the implementation of EWSs into GP Practice	1, 6, 7
Environmental Context And Resources	Environmental stressors	1, 6
	Resource/material resources	3
	Barriers	1, 3, 4, 5, 7
	Facilitators	2, 3, 5, 6
Other Relevant Domains	Themes	Relevant Interviews
Beliefs About Capabilities	Confidence in the ability to recognise sepsis	2
Optimism	Optimism - those supportive of the introduction of EWSs to GP Practice	2, 3, 5
	Pessimism those not supportive of the introduction of EWSs to GP Practice	1, 6
Memory, Attention, And Decision Processes	Decision making	3, 4, 6, 7
	Cognitive overload/tiredness	1, 6
Social Influences	Social norms (Other GPs using EWSs)	1, 2, 4
	Awareness of sepsis	4, 8
Emotion	Stress	1, 6
	Positive/negative affect	5
Behavioural Regulation	COVID-19 and EWSs	1, 3, 4, 6, 7
	Benefit from a Medico-legal perspective	5

The dominant domains, Knowledge, Skills, Beliefs about Consequences, and Environmental Context and Resources were selected based on the most commonly occurring themes within the interviews and are presented in Figure 1. Other relevant domains and findings are presented in Supplemental File 3.

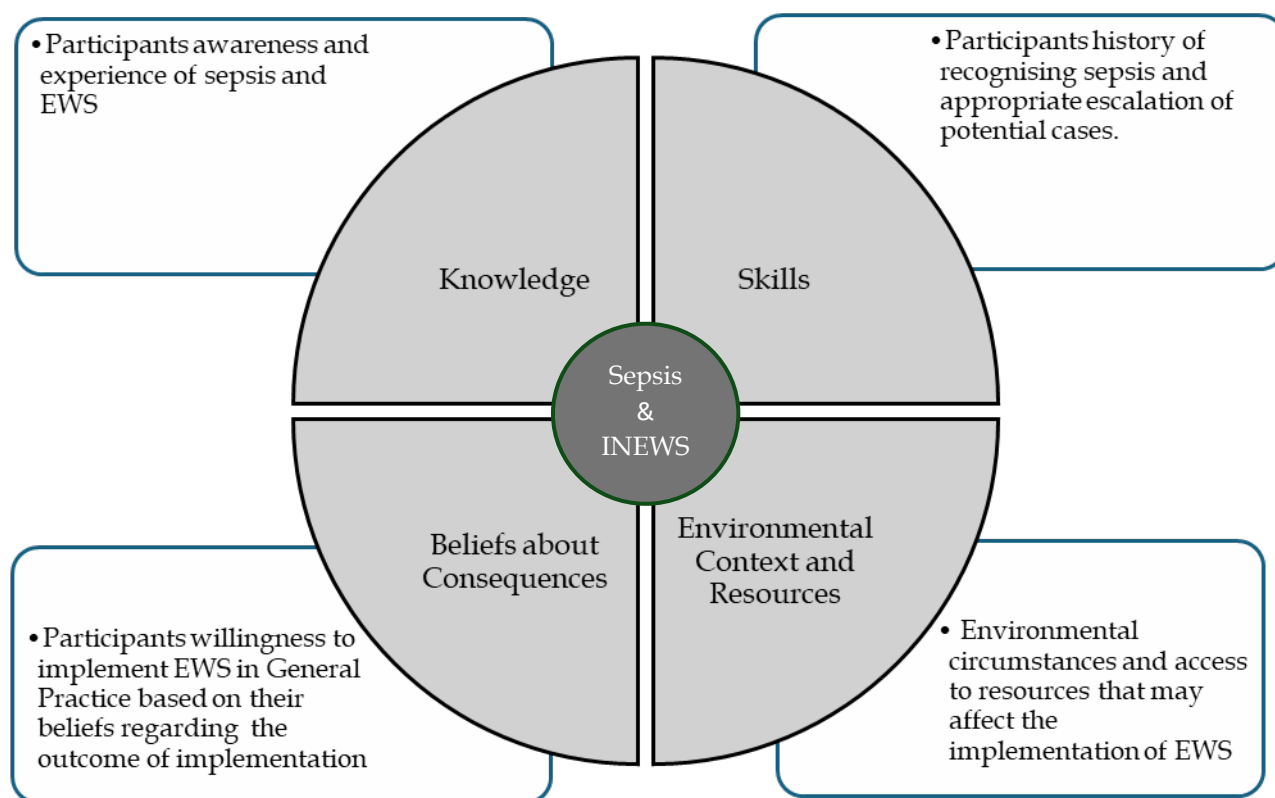


Figure 1: Conceptual Model of Major TDF Domains

Dominant Domains:

Knowledge

Knowledge of sepsis and of EWSs demonstrated GPs awareness of sepsis, presentation in practice, frequency of sepsis presentation, their awareness of the EWS, and application within the healthcare setting. Participants spoke of their knowledge of sepsis (Participant (P)1, P3, P4). All participants had knowledge of sepsis with no participant indicating a missed diagnosis of sepsis during their time in practice (P1 – 8).

"I would have undergraduate training in sepsis probably during the postgraduate training for general practice, and actually, in the last few years there has been a lot of public awareness about sepsis so we would have been mailed with various posters and various leaflets about sepsis." P4

"...hospital training in ED (emergency department), you know, the usual-sepsis 6. We haven't had any formal training, well for general practice, we do 2 months in the hospital, 6 months of that in General Med, so we would receive the usual training, during our clinical years." P1

All participants had an awareness of the EWS, while some were more familiar with it than others. Several of the participants used EWS in their practice (P3, P4, P5, P6).

"I've been using the NEWS2 (Irish EWS) score for any patient of mine with any acute illness."
P3

Skills

Recognition of possible cases of sepsis demonstrates the participants' history of patient care with appropriate escalation of potential cases demonstrating capability and action in line with optimum management. Participants were confident in their ability to recognise sepsis, speaking of their past experiences with patients who presented to them with sepsis (P1, P3, P4, P5, P7, P8).

"I examined her and there was nothing to find, you know, her pulse was in the normal range, her BP (blood pressure) was in the normal range, her temperature was normal, her mental state was normal, so I'd those five done, and then I measured her respiratory rate, and her respiratory rate was twice normal. And I had to do a double take because, you know, everything else was perfect." P3

All participants confirmed that should someone present to them with sepsis, the patient would be sent directly to the Emergency Department (ED) (P's1-8) with the GP, contacting the ED ahead of time to alert the clinical team in advance of the patient's arrival.

"I would ring the hospital and explain that there is a person coming in, that potentially has sepsis, and that they need to be treated rapidly, and stress rapidly, when they arrive." P3

Beliefs about Consequences

Participants expressed the belief that implementing an EWS sepsis identification tool in a GP setting would be beneficial, for both them and their patients (P2, P3, P4, P5). Participant three, who currently uses it, stated that *“it supports the clinical judgment”*, participant four stated that it *“helps you in your clinical judgment”* and participant five spoke about their belief that it is helpful to help document the assessment in this way, should a legal situation ever arise.

“I remember another doctor who was on the medical council and an advisor for years, and the first time she saw a presentation on it, she said that she just felt that if you just did that in general practice, it would save you so much in terms of med-legal...” P5

Some participants did not feel that there would be positive consequences to implementing the EWS's at this level, mainly due to GPs' time and the low number of cases that present to primary care each year (P1, P6).

“In the great scheme of things, probably not, it would be the infrequency of presentation and if you look at what is required once sepsis is kind of on the radar you're looking at the “Take3 - Give3”, I don't think that many GPs would be able to put in a line, wouldn't have antibiotics to give, well at the correct dose, they mightn't even have oxygen in the current climate so, if I was to give you a list of the top 100 things “killing” GPs right now, I don't think sepsis would even be on the radar, you know?” P6

Environmental Context and Resources

Environmental stressors and resources were relevant to the participants, and it was felt could negatively influence implementation of EWSs.

“At the moment, I'd be seeing between 26 and 36 patients a day in person... if one of those gets sick, as it happens, ... it can throw the whole morning off...” P1

Similarly, the fact that EWSs have not been validated in primary care, whether they would be useful in such a short consultation time and whether they could be implemented into their computer systems were perceived as barriers to implementation (P3, P4).

“It hasn't been validated in primary care, that's the key, you know? It's been validated in secondary care...” P3

The potential for inclusion of the EWS as part of the computerised assessment process was seen as an enabler for implementation.

“I think (it) would be very helpful is if it was introduced as part of the software that you could actually pop it in, and there’d be a prompt and a reminder...” P5

One participant who routinely used an EWS in their practice, confirmed that it takes them very little time to complete, and that GPs' should be measuring five of the six parameters routinely in their consultations.

“It takes very little time actually and I would say we routinely measure 5 of the 6, or should measure 5 of the 6 parameters on people who are sick anyway...” P3

Participant six, while not supportive of the introduction of EWS does use the assessment and referred to it as *“a fail-safe process”*.

Other Relevant Domains

Other Relevant Domains included Beliefs about Capabilities, Optimism, Memory, Attention and Decision Processes, Social Influences, Emotion and Behavioural Regulation, Table 2.

Discussion

This qualitative study provides insights into the knowledge and experience of identification and management of sepsis amongst GPs and, their attitudes towards the use of EWS in practice. All the participants had knowledge of sepsis, EWSs and associated parameters, from both their years of training and from experience in the acute sector, GP practice and some personal experience. Sepsis training has been reported not be associated with improved accurate patient diagnosis of sepsis²¹ however clinical examination and recognition of sepsis symptoms did improve accurate diagnosis^{21,22}.

Participants were experienced and confident in their ability to recognise potential cases of sepsis within their patients, and an increased respiratory rate was indicated as a source of concern. The respiratory rate has been referred to as *“the most neglected vital sign”* and is often estimated by doctors rather than counted²³ and was indicated as a key sign for sepsis in the findings of this study. Participants indicated they would notify the emergency department ahead of the patient’s arrival to ensure that they were aware of a potential sepsis case, so as not to delay treatment time.

Participants expressed positive beliefs regarding the benefits of an EWS tool to support identifying early deterioration in patients with sepsis, speaking about their relationship with their patients and *“knowing”* when they are unwell. This is supported where GPs use *“gut feeling”* to diagnose sepsis. However, *“gut feeling”* cannot always be relied upon,

sometimes resulting in preventable negative outcomes, and use of sepsis recognition tools can support GP decision making ²¹.

Participants identified barriers to the implementation of EWS in general practice including, lack of time, resources, training, and the rarity of sepsis presentation in primary care. However, they also identified potential positive outcomes associated with the use of EWS amongst those who were using it. While EWS's have not been validated for the primary care, six parameters (respiratory rate, heart rate, temperature, systolic blood pressure, consciousness level, and oxygen saturation) are all measurable in this setting and are included in recent guidelines ¹⁴.

Strengths of this study include the qualitative design using the TDF ¹⁸ which provided a validated framework to gather and analyse data providing a deep understanding of the participant's experiences and views. Data were analysed independently by two researchers and decisions were agreed to enhance the trustworthiness of the findings as per the COREQ checklist ¹⁹. Limitations include the use of purposive sampling with the support of a GP involved in the research possibly introducing an element of sampling / response bias. In addition, there were no participants from rural only practices interviewed due to recruitment challenges which could influence the transferability of the research. However, the sample is representative of a wide range of geographical areas, gender, and experience.

The findings highlight the challenges that GPs are experiencing clinically²⁴, influencing openness to the introduction of additional elements of care balanced with the benefit of cognitive and accurate documentation. Additional supports for GPs related to safe workload limits are called for with pressured management of complex cases flagged as a patient safety issue ²⁵. Currently no EWS tool is validated for primary care ²⁶. Sepsis is a challenging condition to diagnose as the presentation is variable. A greater understanding the role of EWSs and how they could be used in general practice to support clinical judgment is an important area for future research with the potential to improve patient safety.

Acknowledgment:

The Irish national clinical programme for sepsis established a Steering Group called "GPSEPway" whose aim is to implement and evaluate a sepsis pathway for GP. This research was carried out on behalf of and supported by the GPSEPway Group.

Declarations of Conflicts of Interest:

None declared.

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Supplemental Files:

Supplemental File 1. Consolidated criteria for reporting qualitative studies (COREQ): 32-item checklist

No. Item	Guide questions/description	Reported on Page #
Domain 1: Research team and reflexivity		
<i>Personal Characteristics</i>		
1. Interviewer/facilitator	Which author/s conducted the interview or focus group?	Page 5
2. Credentials	What were the researcher's credentials? E.g. PhD, MD	Cover sheet (pg. 2)
3. Occupation	What was their occupation at the time of the study?	Cover sheet (pg. 2)
4. Gender	Was the researcher male or female?	Supplemental File 2 Reflexivity Statement pg. 18
5. Experience and training	What experience or training did the researcher have?	Supplemental File 2 Reflexivity Statement pg. 18
<i>Relationship with participants</i>		
6. Relationship established	Was a relationship established prior to study commencement?	Page 5 - No
7. Participant knowledge of the interviewer	What did the participants know about the researcher? e.g. personal goals, reasons for doing the research	Page 5
8. Interviewer characteristics	What characteristics were reported about the interviewer/facilitator? e.g. Bias, assumptions, reasons and interests in the research topic	Supplemental File 2 Reflexivity Statement pg. 18

Domain 2: study design		
<i>Theoretical framework</i>		
9. Methodological orientation and Theory	What methodological orientation was stated to underpin the study? e.g. grounded theory, discourse analysis, ethnography, phenomenology, content analysis	Page 5 Thematic Analysis using the Theoretical Domains Framework
<i>Participant selection</i>		
10. Sampling	How were participants selected? e.g. purposive, convenience, consecutive, snowball	Page 5 – Purposive sampling
11. Method of approach	How were participants approached? e.g. face-to-face, telephone, mail, email	Page 5
12. Sample size	How many participants were in the study?	Page 5
13. Non-participation	How many people refused to participate or dropped out? Reasons?	Page 5. No refusals or drop-outs
<i>Setting</i>		
14. Setting of data collection	Where was the data collected? e.g. home, clinic, workplace	Page 5
15. Presence of non-participants	Was anyone else present besides the participants and researchers?	No, page 5.
16. Description of sample	What are the important characteristics of the sample? e.g. demographic data, date	Page 5
<i>Data collection</i>		
17. Interview guide	Were questions, prompts, guides provided by the authors? Was it pilot tested?	The semi structured interview guide was approved by Group members in advance of data collection.
18. Repeat interviews	Were repeat inter views carried out? If yes, how many?	No
19. Audio/visual recording	Did the research use audio or visual recording to collect the data?	Yes, via MS Teams not included in the methodology due to journal word count.

20. Field notes	Were field notes made during and/or after the interview or focus group?	Yes, but this detail was not included in the methodology due to journal word count.
21. Duration	What was the duration of the interviews or focus group?	Not included as cur due to word count. Interviews took between 20 – 30 minutes
22. Data saturation	Was data saturation discussed?	In line with the theoretical approach and the exploratory nature of the research data saturation was not discussed. Interviews were conducted with the maximum number of participants that could be recruited at the time.
23. Transcripts returned	Were transcripts returned to participants for comment and/or correction?	No
Domain 3: analysis and findings		
<i>Data analysis</i>		
24. Number of data coders	How many data coders coded the data?	2, Page 5
25. Description of the coding tree	Did authors provide a description of the coding tree?	No
26. Derivation of themes	Were themes identified in advance or derived from the data?	Themes were derived from the data and mapped to the TDF
27. Software	What software, if applicable, was used to manage the data?	No software used
28. Participant checking	Did participants provide feedback on the findings?	No
<i>Reporting</i>		
29. Quotations presented	Were participant quotations presented to illustrate the themes/findings? Was each quotation identified? e.g. participant number	Pages 7 – 9 and in Supplemental File 3, page 20
30. Data and findings consistent	Was there consistency between the data presented and the findings?	Pages 7 – 9 and in Supplemental File 3, page 20
31. Clarity of major	Were major themes clearly presented in	Pages 7- 9

themes	the findings?	
32. Clarity of minor themes	Is there a description of diverse cases or discussion of minor themes?	Table 1 Supplemental File 3, Page 20

Supplemental File 2. Author Reflexivity Statements

SM, (MPH, MSc, BA) (Female) completed this research as part of her Master of Public Health under the supervision of two other authors and is a member of the GPSEPway group. She chose this research topic due to personal experiences motivating the desire to improve early identification and appropriate management of sepsis. As a clinical research professional, she understands the impact of bias in research and was cognisant of the when conducting interviews and during the analysis.

DMcC, (MPH, BSc, RGN) (Female) is an Assistant Director of Nursing in sepsis. She is a member of the National Sepsis team and has broad experience in the subject matter. She has been involved in the development of national clinical guidelines and national sepsis reports. She is also the lead nurse in the GPSEPway group. This researcher recognises the gap in early recognition and management of sepsis outside of the acute hospital setting e.g. general practice.

MOD, (MB, BCh, BAO, FFARCSI, FCICM, EDIC, PhD), (Male) is the Clinical Lead on the National Clinical Programme for Sepsis, GPSEPway Group. The researcher's experience as a clinician and national sepsis lead supported the concept development, ensured clinical relevance and appropriateness, and supported the writing of the paper.

MS, (PhD, MPH, RM, RGN) (Female) is a lecturer and researcher with a clinical background in infection prevention and control. She is an academic member of the GPSEPway group and has experience in examining the effect of interventions on practice and outcomes. She has experience in conducting qualitative and quantitative research. The researcher's experience supports a deep understanding of the clinical challenges, and the methodological rigor required in the research process which supports a nonbiased approach to the study.

Supplemental File 3: Other Relevant Domains

Other Relevant TDF Domains	Results	Relevant Quotations
Beliefs about Capabilities	Confidence in the ability to recognise sepsis relates to the TDF “Beliefs about capabilities” as, if GPs do not feel confident in their knowledge of sepsis and its recognition, it may not be something that they are actively looking out for. Whilst most of the participants could speak of previous cases of sepsis that they had encountered during their years practicing, participant two expressed that it was something that maybe they weren’t “suspecting enough” and that it was educational for them to partake in this research.	<i>“...it’s only a matter of time before something, given the current population we’re in, something urgent will come in the door, you know? So, I’d want to be a bit more, I’d want to brush up on these things, sepsis, and on management of MIs and all this stuff.” P2</i>
Optimism	Participants expressed positive attitudes towards the implementation of EWS (P2, P3, P5, P8). Participant five uses it in their practice currently and finds that it is great as a “<i>standardised methodology</i>” and participant six stated that having a score to reference can help if you are clinically undecided about a patient. Some participants were pessimistic about implementation of EWS in General Practice. Participant one did not feel that it would be beneficial as it wasn’t something that they saw often enough in their practice, and participant six, while they currently use it themselves in their practice, didn’t think that sepsis was a	<i>“I think it’d be very good, yeah, and interesting as well because I think sometimes GPs, we don’t expect terrible things to walk in the door and when they do sometimes, we’re a bit flummoxed.” P2</i> <i>“I guess from my experience of sepsis in general practice, and it is quite limited, the last case I had, her early warning score would’ve been 3 and she was in ICU about 4 hours later. What I will say is that some people will be fine right up until they’re not” P1</i>

big enough issue in primary care, when compared to other illnesses that GPs usually deal with.

**Memory,
Attention and
Decision
Processes**

EWS was reported to be a useful tool in decision-making when GPs might be unsure (P3, P4, P6, P7). Participant three confirmed that the early warning scores “don’t override your clinical judgement”, and participant four confirmed that they found it to be helpful in their decision-making when they might be clinically undecided.

“It’s handy in general practice, because the vast majority of people are not in that very sick bracket as they can appear to be not very unwell and you’re kind of clinically undecided so I find sometimes when you have a score to reference it helps you in your clinical decision making.” P4

Participant six was not sure that it would be helpful in decision making and participant seven raised the issue of the appropriateness of when to use the tool.

“GPs look at things in a 30 second snapshot.” P6

Cognitive overload/tiredness fits into this category as this make affect participants' memory, attention, and decision-making if they are overloaded or over-tired due to added paperwork/processes, and this was echoed by participants one and six.

“The key thing would be to know when to use it.” P7

**Social
Influences**

GPs' awareness of other GPs' using the EWS may possibly influence their opinion on its implementation, placing this in the Social Influences domain. Participants spoke about their role as GP trainer and when training GPs and doctors who were involved in the COVID-19 assessment hubs (P3, P4). Most of the GPs were not aware of their practice colleagues using EWS currently, even if they themselves used it (P1, P2, P3, P8).

“Public awareness campaigns definitely are helpful, not too much, too often, just at intervals to remind people to consider sepsis and the early warning signs.” P4

“Often when you talk to a patient about it, they don’t have a

Patient and GP awareness of sepsis may also affect the presentation to GPs with sepsis-related symptoms. Participant four spoke about an increased awareness of sepsis in the last 10 years in General Practice however another participant felt patients were not sufficiently aware of sepsis (8).

clue what you're talking about." P8

Emotion

Stress and the positive/negative affect fit into the emotion TDF as how GPs feel about the introduction of EWS will possibly positively or negatively affect them emotionally.

"I don't have time for another form." P1

Participants expressed their concerns about adding extra workload onto already struggling GPs.

"We can only focus on so many things." P6

Behavioural Regulation

Most participants confirmed that they used either the EWS or a similar assessment approach when assessing patients with possible COVID-19 and provided positive feedback on its usefulness (P1, P3, P4, P6, P7, P8). Some participants stated that they worked in the COVID-19 assessment hub in their county and that the EWS was used during their assessments (P3, P5, P7).

"A full set of obs. (observations), early warning score, well not early warning scores as such, but respiratory rate, oxygen saturation, blood pressure, we didn't use an early warning score, formal one, but we certainly did transfer out, based on clinical condition." P1

Participant five spoke about how the use of these early warning scores can also be beneficial in terms of legal situations, stating that she feels that it is "protective" because if a patient was to deteriorate later, there is an accurate recording of the assessment at that particular point in time.

"I think it's protective, I suppose because a) it's recorded if they deteriorate later and b) legally it protects you because you've made that assessment at that particular point in time, so I think it's extremely helpful." P5