Survey of adherence to sepsis care bundles in six European countries shows low adherence and possible patient risk

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ABSTRACT

Sepsis is a life-threatening condition which globally claims more lives than cancer. A set of evidence-based clinical practices (sepsis bundles) have been developed to guide early diagnosis and rapid intervention, which are vital to patient survival; however, their use is not widely adopted. A cross-sectional survey was administered in June–July 2022 to understand healthcare practitioner (HCP) knowledge of and adherence to sepsis bundles and identify key barriers to adherence in the UK, France, Spain, Sweden, Denmark and Norway; a total of n=368 HCPs ultimately participated. The results showed that among HCPs, overall awareness of sepsis and the importance of early diagnosis and treatment is high. However, there are indications that adherence to sepsis bundles is well below the standard of care: when asked which steps providers carry out to treat sepsis, only 44% report carrying out all steps in the bundle; and 66% of providers agreed that delays in sepsis diagnosis occur sometimes where they work. This survey also highlighted the possible barriers which are impeding the implementation of optimal sepsis care: particularly high patient caseload and staff shortages. This research highlights important gaps and obstacles in reaching optimal care of sepsis in the surveyed countries. There is a need for healthcare leaders and policy-makers alike to advocate for increased funding for more staff and training to address existing knowledge gaps and improve patient outcomes.

INTRODUCTION

Sepsis is a life-threatening condition in which the body's response to infection causes organ damage. Globally, sepsis claims more lives than cancer.[1] In Europe, 3.4 million people are affected annually, and incidence rates are rising.[2 3] Early diagnosis and rapid intervention are vital to patient survival. A set of evidence-based clinical practices (sepsis bundles) have been developed to guide intervention and treatment.[4 5] The hour-1 sepsis bundle (SEP-1) consists of a set of interventions to begin immediately in all patients with suspected sepsis or septic shock. However, despite evidence that routine implementation of sepsis bundles by clinicians can greatly improve patient outcomes, their use is not widely adopted.[4–7]

To mark World Sepsis Day 2022, Ipsos conducted a survey on behalf of bioMérieux and The UK Sepsis Trust to understand healthcare practitioner (HCP) knowledge of sepsis and adherence to sepsis bundles and identify key barriers to adherence in the UK, France, Spain, Sweden, Denmark and Norway.

METHODS

A 10 min online survey (online supplemental appendix 1) was administered between 20 June 2022 and 18 July 2022. HCPs were recruited from a proprietary vendor panel (a database built over time to include members of the public who have indicated willingness to take part in surveys through open recruitment and direct campaigns) using an external sampling team to locate eligible respondents and invite them to participate via email. Eligibility criteria included being an emergency department physician, general surgeon, internal medicine physician, critical care physician or pulmonologist; being qualified for 3–30 years; spending the majority of clinical time in a hospital; and spending at least 50% of professional time in direct patient care. Participants indicated consent in the survey introduction and were remunerated according to fair market value after completion. For analysis purposes, due to small sample sizes, the three Nordic countries (Sweden, Denmark and Norway) were grouped together. We present descriptive statistics.

RESULTS

A total of n=368 HCPs completed the survey (UK n=100, France n=100, Spain n=100, Nordics n=68 (Norway n=2, Denmark n=16,

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Table 1 Survey results, by country

	Overall n=368	UK n=100	France n=100	Spain n=100	Nordics n=68
Sepsis knowledge					
Knowledge of sepsis condition (know a great deal or somewhat knowledgeable)	99% (365)	100% (100)	98% (98)	99% (99)	100% (68)
Familiarity with sepsis-3 definition (very familiar or fairly familiar)	79% (298)	89% (89)	80% (80)	88% (88)	60% (41)
Knowledge of sepsis bundles (know a great deal or somewhat knowledgeable)	77% (293)	95% (95)	66% (66)	94% (94)	56% (38)
Early detection can lead to significantly better outcomes (strongly agree or somewhat agree)	98% (362)	99% (99)	98% (98)	99% (99)	97% (66)
Practices in hospital					
There is sometimes a delay in diagnosing sepsis in the hospital where I work (strongly agree or somewhat agree)	66% (243)	67% (67)	43% (43)	87% (87)	68% (46)
We do miss cases of sepsis in the hospital where I work (strongly agree or somewhat agree)	56% (205)	68% (68)	32% (32)	67% (67)	56% (38)
I consistently follow protocols in place in my hospital for treating sepsis (strongly agree or somewhat agree)	87% (318)	93% (93)	78% (78)	83% (83)	94% (64)
Adherence to sepsis bundles					
Extent actions in SEP-1 are followed in hospital (To a great extent or to some extent)	96% (353)	97% (97)	93% (93)	95% (95)	100% (68)
Identification of steps in SEP-1 Base: respondents aware of sepsis bundles (% correctly selecting step as part of bundle)					
Obtain blood cultures before administering antibiotics	95% (277/293)	96% (91/95)	91% (60/66)	95% (89/94)	97% (37/38)
Administer broad-spectrum antibiotics	90% (263/293)	96% (91/95)	80% (53/66)	90% (85/94)	89% (34/38)
Administer intravenous fluid: rapid administration of 30 mL/kg crystalloid for hypotension or lactate >4 mmol/L	88% (257/293)	83% (79/95)	86% (57/66)	93% (87/94)	89% (34/38)
Measure lactate level and remeasure if the initial level is elevated	86% (251/293)	95% (90/95)	76% (50/66)	86% (81/94)	79% (30/38)
Fluid resuscitation	85% (250/293)	93% (88/95)	74% (49/66)	87% (82/94)	82% (31/38)
Apply vasopressors if hypotensive during or after fluid resuscitation to maintain a mean arterial pressure >65 mm Hg	73% (214/293)	47% (45/95)	83% (55/66)	89% (84/94)	79% (30/38)
HCPs correctly selecting all steps in SEP-1 sepsis bundle from a prompted list Base: respondents aware of sepsis bundles	53% (154/293)	43% (41/95)	48% (32/66)	64% (60/94)	55% (21/38)
HCPs reporting conducting all steps contained within sepsis bundles to diagnose and treat suspected sepsis	44% (163)	52% (52)	42% (42)	40% (40)	43% (29)
Barriers to sepsis bundle adherence					
High patient caseload	59% (219)	74% (74)	48% (48)	62% (62)	51% (35)
Staff shortages	58% (214)	76% (76)	51% (51)	53% (53)	50% (34)
Insufficient training	34% (123)	32% (32)	27% (27)	38% (38)	38% (26)
Test results not communicated quickly enough	30% (115)	38% (38)	28% (28)	35% (35)	21% (14)
Lack of familiarity with steps	32% (114)	29% (29)	28% (28)	29% (29)	41% (28)

Table 1 Continued

	Overall n=368	UK n=100	France n=100	Spain n=100	Nordics n=68
Inability to rapidly reassess patient	29% (107)	36% (36)	17% (17)	37% (37)	25% (17)
Lack of rapid diagnostic tests	27% (102)	33% (33)	28% (28)	30% (30)	16% (11)
Resources being prioritised to other patients	21% (75)	29% (29)	12% (12)	13% (13)	31% (21)
Public reluctance to seek help early	21% (78)	16% (16)	25% (25)	26% (26)	16% (11)
Concern for antimicrobial resistance	18% (72)	15% (15)	28% (28)	25% (25)	6% (4)
Equipment availability	14% (53)	16% (16)	12% (12)	22% (22)	4% (3)
Reluctance to administer antibiotics	12% (48)	13% (13)	18% (18)	15% (15)	3% (2)
Equipment not working	5% (20)	7% (7)	7% (7)	4% (4)	3% (2)

HCPs, healthcare practitioners; SEP-1, hour-1 sepsis bundle.

Sweden n=50)). The sample included n=96 emergency department physicians, n=115 general surgeons, n=36 internal medicine physicians, n=29 critical care physicians and n=92 pulmonologists. Overall, total results are weighted based on country averages, with equal weighting across the UK, France, Spain and the Nordic countries (table 1).

Sepsis knowledge: Reported knowledge of sepsis was very high: 99% of HCPs agreed they were somewhat knowledgeable or knew a great deal. Familiarity with the definition of sepsis-3 was also high: 79% of HCPs were at least fairly familiar, however, this was notably lower among the Nordics (60%). Reported knowledge of sepsis bundles was also fairly high overall (77%) but differed across countries: 95% of HCPs in the UK and 94% Spain reported they were at least somewhat knowledgeable about sepsis bundles compared with 66% in France and 56% in the Nordics.

Practices in hospital: Eighty-seven per cent of HCPs agreed they consistently follow protocols in place in their hospital to treat sepsis. However, 66% also agreed that delays in sepsis diagnosis occur sometimes where they work, and 56% agreed that some cases of sepsis are missed where they work.

Adherence to sepsis bundles: Ninety-six per cent of HCPs reported SEP-1 is followed in their hospital to at least some extent, but when prompted to select all the actions in SEP-1, only 53% of those aware of sepsis bundles correctly identified all the steps. The percentage of HCPs correctly identifying all steps was highest in Spain (64%) and lowest in the UK (43%). The most frequently missed step in the bundle was to apply vasopressors if hypotensive during or after fluid resuscitation to maintain a mean arterial pressure >65 mm Hg (selected by 73%

of respondents). Forty-four per cent of HCPs reported following all steps to diagnose and treat suspected sepsis.

Barriers to adherence: High patient caseload and staff shortages were the most frequently selected barriers across all countries (59% and 58%, respectively). Lack of familiarity with steps (32%), insufficient training (34%), test results not being communicated quickly enough (30%), lack of inability to rapidly reassess patients (29%) and lack of rapid diagnostic tests (27%) were also identified as key barriers.

DISCUSSION

Among HCPs surveyed, overall awareness of sepsis and the importance of early diagnosis and treatment is high, but there are gaps in knowledge of sepsis bundles and indications that adherence to sepsis bundles is well below the standard of care. First, it appears that individual knowledge of all sepsis bundle steps and adherence to them in practice is low: when asked which steps providers carry out to treat sepsis, only 44% report carrying out all steps in the bundle—meaning that more than half of patients may not be receiving the standard of care. SEP-1 is considered the gold standard for sepsis diagnosis and treatment, however, HCP knowledge scores across countries may be influenced by local operational variation, for example, in the UK, the similar (but not identical) sepsis-6 bundle is in widespread use rather than SEP-1. The high level of HCPs agreeing that delayed diagnosis of sepsis occurs in their workplace (66%) and that some cases of sepsis are missed altogether in their workplace (56%) further reinforces the finding that lack of knowledge and adherence to sepsis bundles may be widespread. Addressing gaps in provider education and training around implementation

of sepsis bundles, particularly reinforcing training on the steps most missed in this survey, can further ensure bundles are adhered to in practice.

Our survey also highlights barriers impeding implementation of optimal sepsis care beyond knowledge of sepsis bundles. Clinic capacity and workload were the most reported barriers (59% and 58%, respectively) across all countries and indicate a clear need for additional staffing support. Barriers related to speed of assessment and diagnosis, and communication of test results were also cited by nearly one in three respondents. Improving capacity to diagnose patients through utilisation of rapid diagnostics could address these challenges and lead to significant decreases in length of hospitalisation and cost, and to overall morbidity and mortality.[8][9]

The limitations of this study should be addressed: we present only cross-sectional data indicating self-reported practices and knowledge, which are subject to recall and social desirability bias. These results may also not be generalisable outside of the European countries in which the research was conducted. However, the results regardless contain valuable insight into an important topic in improving quality of patient care.

CONCLUSION

Early diagnosis of sepsis, rapid intervention and adherence to sepsis bundles are vital to patient survival and reducing global morbidity and mortality from this life-threatening condition. Our survey highlights important gaps and obstacles in reaching optimal care of sepsis in the surveyed countries. There is a need for healthcare leaders and policy-makers alike to advocate for increased funding to address existing knowledge gaps and increase clinic and staff capacity to diagnosis and treat sepsis, and ultimately improve patient outcomes.

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Adherence to Sepsis Bundles

Online survey
10 minutes

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Sample:

	UK	France	Spain	Nordics	TOTAL
ED Physicians	30	30	30	12	102
General Surgery	35	35	35	23	128
Internal Medicine	10	10	10	-	30
Critical Care	5	5	5	15	30
Pulmonologists	20	20	20	20	80
TOTAL	100	100	100	70	370

Note to recruitment team: Please ensure that there is a geographical spread of the sample, profiled at SRegion. This is to allow us to gain a sample from a spread of hospitals.

Signed off for scripting / translation by:	
AD/D	
PM	

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SCREENER

SCOUNTRY.
In which country do you live?

(Please select one answer only)

1. United Kingdom
2. France
3. Spain
4. Sweden
5. Denmark
6. Norway
99. None of these **[FIX, CLOSE]**

[SINGLE CODE. CODE THOSE SELECTING CODES 4, 5 OR 6 AS 'NORDICS'. CHECK COUNTRY QUOTAS]

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SINTRO.

This survey is being conducted by Ipsos, an independent market research agency based in the UK, on behalf of a pharmaceutical company and a UK-based charity.

We are conducting research **to understand the management and treatment of health conditions** and would like to ask you some questions on this topic.

The survey will take approximately **10 minutes** of your time. If you meet the profile of people we are looking to for opinions, you will receive an honorarium for your participation.

With your consent, your information will only be collected and used for market research purposes**.** Answers may be used in external publications, any information you give will be treated in the strictest confidence and results will only be reported back on an aggregated basis. We may need to send some of your personal data outside of the UK or your country of residence. We will make sure that it is kept secure at all times.

As a member of the Market Research Society (MRS), Ipsos is bound by the MRS Code of Conduct and all applicable laws protecting your personal data and responses. The study is conducted in compliance with MRS / ESOMAR / EphMRA **[PN: UK ONLY -** / British Healthcare Business Intelligence Association**]** guidelines and codes. Participation in the survey is voluntary, and you can change your mind at any time. You have the right to withdraw from the interview at any time. For more information about your rights and how data will be used, please see our privacy notice, it is available here **[SCRIPTERS TO INSERT PRIVACY POLICY LINK AT THE WORD 'HERE'].**

This processing of your personal data will be carried out on behalf of the pharmaceutical company and UK-based charity sponsoring this research, based on a legitimate interest to conduct market research and analysis, and exclusively for this study.

Are you happy to participate in this research as set out above and in the privacy notice?

(Please select one answer only)

1. Yes, I wish to continue
2. No, I do not wish to continue **[CLOSE]**

[SINGLE CODE]

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SSPECIALTY.

Which of the following, if any, **best describes your primary medical specialty?**

(Please select one answer only)

1. Emergency Department Physician
2. General Surgeon
3. Internal Medicine Physician
4. Critical Care Physician
5. Pulmonologist
6. Other [CLOSE]
7. Infectious Disease Spercliast [SHOW ONLY IN NORWAY, SWEDEN AND DENMARK]
99. I prefer not to say [CLOSE]

[SINGLE CODE]

SYEARSQUALIFIED

For approximately how many years have you been **qualified in your current primary medical specialty**?

(Please type in your answer)

1. OPEN NUMERIC BOX – RANGE OF 0-99
99. I do not know [CLOSE]
100. Prefer not to say [CLOSE]

[CLOSE IF <3 OR >30 YEARS; OPEN NUMERIC]

SCLINICALPRACTICE.

In a typical month, approximately what proportion of your time, if any, is spent in **direct patient care** as opposed to other activities such as research, teaching, and administration?

(Please type in your answer)

o Range 0-100%

99. I do not know [CLOSE]
100. Prefer not to say [CLOSE]

[PN: OPEN NUMERIC. 0-100%. CLOSE IF <50%]

SSETTING.

Which of the following **settings**, if any, best describes where you **spend the majority of this clinical time** (taking care of patients)?

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1. Teaching / University Hospital
2. Non-teaching Hospital
3. Private Hospital
4. Urgent care clinic outside a hospital **[CLOSE]**
5. Office-based practice / Private practice **[CLOSE]**
6. Other setting **[CLOSE]**
99. I do not know **[CLOSE]**
100. Prefer not to say **[CLOSE]**

[SINGLE CODE.]

SSETTINGSIZE.

Please think about the hospital in which you spend the majority of your clinical time (taking care of patients).

Approximately **how many beds does this hospital have**?

(Please select one answer only – if you are not sure, please give your best estimate)

1. Fewer than 100 beds
2. 100 – 300 beds
3. 301 – 500 beds
4. 501 – 700 beds
5. More than 700 beds
99. I do not know
100. Prefer not to say **[CLOSE]**

[SINGLE CODE. NO QUOTA AT PRESENT – MONITOR DURING FIELDWORK]

SDECISIONMAKER.

Which of the following, if any, best describes your **responsibility regarding the management of patients who have been hospitalised with health conditions**?

1. I am the primary decision maker
2. I am one of the decision makers
3. I am consulted on my opinion by others making the final decision
4. I am not involved in the decision
99. I do not know
100. Prefer not to say **[CLOSE]**

[SINGLE CODE]

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SREGION.
Which **region** of **[INSERT ANSWER FROM SCOUNTRY]** **do you live in?**

(Please select one answer only)

1. **INSERT LIST AS SHOWN IN APPENDIX A**
99. I prefer not to say

[SINGLE CODE; NO QUOTA AT PRESENT – MONITOR DURING FIELDWORK]

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Main Questionnaire

INTRO. SHOW TO ALL RESPONDENTS THEN PROCEED TO NEXT QUESTION

Many thanks for your answers so far.

We are pleased to say that you meet the profile of healthcare professionals we are looking for to complete our survey.

The remainder of the survey will take approximately 9 minutes.

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SECTION A: SEPSIS AWARENESS AND CURRENT PRACTICE

A1. ALL RESPONDENTS
How much, if anything, would you say **you know about the following conditions?**

[ACROSS THE TOP]

1. I know a great deal
2. I am somewhat knowledgeable
3. I have heard of it but know nothing about it
4. I have never heard of it
99. I do not know

[DOWN THE SIDE]

1. Sepsis
2. Meningitis
3. Epilepsy
4. Diabetes
5. Stroke
6. Asthma
7. Acute kidney injury
8. Cystic fibrosis

[SINGLE CODE PER ROW. RANDOMISE ROWS.]

A2. ALL RESPONDENTS
Using the scale below, please indicate how **serious**, if at all, you feel developing **Sepsis** is for the patients you treat in hospital?

By serious, we are referring to how likely it is to pose a risk to life.

1. Very serious
2. Fairly serious
3. Not very serious
4. Not at all serious
99. I do not know

[SINGLE CODE PER ROW.]

NEW SCREEN: Thank you. In the remainder of the survey, we will focus on Sepsis.

Sepsis is a life-threatening reaction that happens when the immune system overreacts to an infection and starts to damage the body's own tissues and organs.

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A3. ALL RESPONDENTS

To what extent, if at all, are you familiar with the Sepsis-3 definition of Sepsis?

1. Very familiar
2. Fairly familiar
3. Not very familiar
4. Not at all familiar
99. I do not know

[SINGLE CODE, ONLY THIS LIST SHOWN.]

A4. ALL RESPONDENTS.
In a typical week, approximately what proportion of your hospitalised patient caseload, if any, suffer with:

- Suspected Sepsis
- Confirmed Sepsis

Please think about all the patients you personally manage in hospital. This could be patients who present with the condition or develop it in hospital. If you are unsure, please provide your best estimate.

1. Suspected Sepsis _____%
2. Confirmed Sepsis _____%

[PN: OPEN NUMERIC. CODE 1 + CODE 2 MUST BE EQUAL TO OR LESS THAN 100%. ADD A DON'T KNOW OPTION FOR EACH CODE.]

A5. ALL RESPONDENTS.
To what extent do you **agree or disagree**, if at all, with each of the following statements?

(Please select one answer per statement. If you have no opinion or do not know, please select 'I do not know').

[COLUMNS:]

1. Strongly agree
2. Somewhat agree
3. Neither disagree nor agree
4. Somewhat disagree
5. Strongly disagree
99. I do not know

[ROWS:]

1. My country's health system is doing all they can to tackle Sepsis
2. Sepsis increases both morbidity and mortality

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3. There is a clear Sepsis protocol in the hospital where I work
4. I consistently follow protocols in place in my hospital for treating Sepsis
5. Early detection of Sepsis can lead to significantly better outcomes
6. We do miss some cases of Sepsis in the hospital where I work
7. There is sometimes a delay in diagnosing Sepsis in the hospital where I work
8. Sepsis is easy to diagnose
9. Sepsis is easy to treat
10. Antimicrobial resistance is a challenge for treating infections in general
11. Rapid diagnostic tests play an important role in the management of Sepsis

[PN: SINGLE CODE PER ROW. RANDOMISE ROWS]

A6. ALL RESPONDENTS.
Below is a list of potential early steps health care professionals may take to diagnose and treat patients with suspected Sepsis.

Which of the following **steps**, if any, do you or your team take to **diagnose and treat patients in your hospital with suspected Sepsis?**

1. Identify whether the patient is at a higher risk of developing Sepsis
2. Carry out clinical observations (e.g. temperature, heart rate, respiratory rate, blood pressure and oxygen saturation)
3. Use an Early Warning Score to determine severity
4. Conduct a blood test with cell count
5. Send blood culture to lab
6. Administer antibiotics
7. Administer maintenance IV fluid
8. Apply vasopressors
9. Correct low blood oxygen levels
10. Measure lactate
11. Monitor early stage urine output
12. Fluid resuscitation
13. None of the above **[PN: EXCLUSIVE. FIX]**
99. I do not know **[PN: EXCLUSIVE. FIX]**

[PN: MULTI CODE RESPONSE. RANDOMISE]

A7. ALL RESPONDENTS.
To what extent do you agree or disagree, if at all, with each of the following statements?

[COLUMNS:]

1. Strongly agree
2. Somewhat agree
3. Neither disagree nor agree
4. Somewhat disagree
5. Strongly disagree

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6. I do not know

[ROWS:]

1. Following standardised clinical protocols and delivering autonomous patient care are two actions that are compatible with each other
2. Preserving antibiotics for the future and delivering rapid Sepsis care are two actions that are compatible with each other.

[PN: SINGLE CODE PER ROW. RANDOMISE ROWS]

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SECTION B: SEPSIS BUNDLES AWARENESS AND ADHERENCE

B1. ALL RESPONDENTS.
What **guidelines**, if any, do you or your team **follow for the treatment of Sepsis**?

(Please select all that apply)

1. Hospital protocol
2. SSC (Surviving Sepsis Campaign) Guidelines
3. Sepsis Six
4. Academy of Medical Royal Colleges Guidelines
5. WHO (World Health Organisation) Guidelines
6. NICE (National Institute for Health and Care Excellence) Guidelines **[UK ONLY]**
7. Other guidelines (please specify) **[ADD OE BOX HERE]**
8. I do not follow any guidelines for the treatment of Sepsis **[PN: EXCLUSIVE. FIX]**
99. I do not know **[PN: EXCLUSIVE. FIX]**

[MULTI CODE]

INTRO TEXT: SHOW TO ALL RESPONDENTS THEN PROCEED TO NEXT QUESTION

In the next section of the survey, we would like to focus specifically on **Sepsis Bundles**.

B2. ALL RESPONDENTS.
Before completing this survey today, how much, if anything, would you say you knew about **Sepsis Bundles**?

1. I knew a great deal about Sepsis Bundles
2. I was somewhat knowledgeable about Sepsis Bundles
3. I had heard of Sepsis Bundles but knew nothing about them
4. I had never heard of Sepsis Bundles
99. I do not know

[SINGLE CODE]

B3. RESPONDENTS WHO ARE AWARE OF SEPSIS BUNDLES (CODES 1 OR 2 AT B2).
You have previously said that you are aware of Sepsis Bundles. How, in your own words, would you describe them?

Please be as descriptive as possible.

[OPEN TEXT. ADD A DON'T KNOW RESPONSE.]

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B4. RESPONDENTS WHO ARE AWARE OF SEPSIS BUNDLES (CODES 1 OR 2 AT B2).

Which of the following **actions**, if any, are **involved in the Sepsis Bundles**?

1. Fluid resuscitation
2. Measure lactate level and re-measure if the initial level is elevated
3. Obtain blood cultures before administering antibiotics
4. Administer broad-spectrum antibiotics
5. Administer IV fluid: rapid administration of 30 mL/kg crystalloid for hypotension or lactate ≥ 4mmol/L
6. Apply vasopressors if hypotensive during or after fluid resuscitation to maintain a mean arterial pressure ≥ 65 mmHg
7. None of the above [PN: EXCLUSIVE. FIX]
99. I do not know [PN: EXCLUSIVE. FIX]

[PN: MULTI CODE RESPONSE. RANDOMISE]

[NEW SCREEN: SHOW TO ALL RESPONDENTS THEN PROCEED TO NEXT QUESTION]
Sepsis Bundles are guidelines which have been summarised by the Surviving Sepsis Campaign (SSC) and represent key elements of care regarding the **diagnosis** and **treatment of patients with Sepsis and Septic Shock**.

Below are the main actions involved in the Hour-1 Sepsis Bundle:

1. Measure lactate level and re-measure if the initial level is elevated
2. Obtain blood cultures before administering antibiotics
3. Administer broad-spectrum antibiotics
    a. For adults with possible septic shock or a high likelihood for Sepsis, within 1 hour of recognition
    b. For adults with possible Sepsis without shock, administration within 3 hours from the time when Sepsis was first recognised
4. Administer IV fluid: rapid administration of 30 mL/kg crystalloid for hypotension or lactate ≥ 4mmol/L
5. Apply vasopressors if hypotensive during or after fluid resuscitation to maintain a mean arterial pressure ≥ 65 mmHg

B5. RESPONDENTS WHO ARE NOT AWARE OF SEPSIS BUNDLES (CODES 3 OR 4 OR 99 AT B2).

You have previously said that you are not aware of Sepsis Bundles.

After reading the main actions involved, to what extent, if at all, do you **recognise them as a process for managing Sepsis?**

Please click here [INSERT HYPERLINK TO HOUR 1 SEPSIS BUNDLE DEFINITION HERE] *to see the main actions involved in the Hour-1 Sepsis Bundle again*

1. To a great extent
2. To some extent

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3. Hardly at all
4. Not at all
99. I do not know

[SINGLE CODE]

B6. ALL RESPONDENTS.
In your opinion, do you or do you not think that the actions included in the Hour-1 Sepsis Bundles contain the appropriate steps for the management of Sepsis?

Please click _here_ **[INSERT HYPERLINK TO HOUR 1 SEPSIS BUNDLE DEFINITION HERE]** *to see the main actions involved in the Hour-1 Sepsis Bundle again.*

1. Yes – definitely appropriate
2. Yes – probably appropriate
3. No – probably not appropriate
4. No – definitely not appropriate
99. I do not know

[SINGLE CODE]

B7. ALL RESPONDENTS.
To what extent, if at all, do you think the **actions outlined in the Hour-1 Sepsis Bundle are followed in the hospital within which you work**?

Please click _here_ **[INSERT HYPERLINK TO HOUR 1 SEPSIS BUNDLE DEFINITION HERE]** *to see the main actions involved in the Hour-1 Sepsis Bundle again.*

1. To a great extent
2. To some extent
3. Hardly at all
4. Not at all
5. I do not know
6. Prefer not to say

[SINGLE CODE]

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B8. ALL RESPONDENTS.

Thinking about the patients you personally see who have been diagnosed with Sepsis, approximately **what proportion**, if any, **have the different stages of the Sepsis Bundle below been carried out in?**

If you are unsure, please provide your best estimate

	% of patients
1. Measure lactate level and re-measure if the initial level is elevated	
2. Obtain blood cultures before administering antibiotics	

3. Administer broad-spectrum antibiotics
    a. For adults with possible septic shock or a high likelihood for Sepsis, within 1 hour of recognition
    b. For adults with possible Sepsis without shock, administration within 3 hours from the time when Sepsis was first recognised	

4. Administer IV fluid: rapid administration of 30 mL/kg crystalloid for hypotension or lactate ≥ 4mmol/L	
5. Apply vasopressors if hypotensive during or after fluid resuscitation to maintain a mean arterial pressure ≥ 65 mmHg	
6. I do not use any of these steps with patients who have been diagnosed with Sepsis **[PN: EXCLUSIVE. FIX]**	

[PN: OPEN NUMERIC %. RANGE OF 0%-100% FOR EACH CODE. ADD DON'T KNOW FOR EACH OPTION. FOR CODES 1-6, RESPONDENTS SHOULD GIVE A NUMERIC RESPONSE OR SELECT DON'T KNOW.]

B9. ALL RESPONDENTS.

What do you believe are the **main barrier(s)**, if any, to adhering to the stages outlined in the Sepsis Bundle?

Please click here **[INSERT HYPERLINK TO HOUR 1 SEPSIS BUNDLE DEFINITION HERE]** *to see the **main stages involved in the Hour-1 Sepsis Bundle** again.*

1. Concern for antimicrobial resistance
2. Reluctance to administer antibiotics
3. Insufficient training
4. Lack of familiarity with the steps
5. Resources being prioritised to other patients
6. Equipment availability
7. Staff shortages
8. High patient caseload

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9. Equipment not working
10. Lack of rapid diagnostic tests
11. Test results not communicated quickly enough
12. Inability to rapidly reassess patient
13. Public reluctance to seek help early
14. Other barrier (Please specify) **[PN: FIX. ADD OE BOX HERE]**
15. There are no barriers **[PN: EXCLUSIVE. FIX]**
99. I do not know **[PN: EXCLUSIVE. FIX]**

[PN: MULTI CODE RESPONSE. RANDOMISE]

B10. RESPONDENTS WHO SELECTED A BARRIER (CODES 1-10 AT B9).
You previously stated that **[INSERT ALL SELECTED FROM B9 SEPARATED BY A COMMA]** are the main barriers to adhering to Sepsis Bundles.

Why do you believe that these are barriers?

Please explain your rationale fully for each barrier.

Please click here **[INSERT HYPERLINK TO HOUR 1 SEPSIS BUNDLE DEFINITION HERE]** *to see the **main actions involved in the Hour-1 Sepsis Bundle** again.*

[PN: OPEN TEXT RESPONSE. SHOW ON SAME PAGE AS B9. ADD A DON'T KNOW RESPONSE OPTION.]

B11. RESPONDENTS WHO SELECTED A BARRIER (CODES 1-10 AT B9).
What, if anything, can be done to help **improve the adherence of Sepsis Bundles in the hospital where you work**?

1. Receiving training on what Sepsis Bundles are
2. Receiving training on how to implement Sepsis Bundles
3. Better communication of audit results
4. Monthly team feedback
5. More staff
6. Rapid diagnostic tests
7. Ability to rapidly reassess patient
8. Incorporation of Sepsis Response Team (SRT) in the hospital (a team of specifically trained healthcare professionals educated in early recognition, diagnosis, and treatment of Sepsis)
9. Something else can be done (please specify) **[PN: FIX. ADD OE BOX HERE]**
10. Nothing can be done **[PN: EXCLUSIVE. FIX]**
99. I do not know **[PN: EXCLUSIVE. FIX]**

[PN: MULTI CODE RESPONSE. RANDOMISE]

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SECTION C: CASE STUDIES

NEW SCREEN:
Thank you for your answers so far.

[NOTE FOR SCRIPTING: THIS IS PATIENT CASE STUDY NUMBER 1] We would now like you to imagine a scenario where **an active 70-year-old male with pneumonia has been admitted to the hospital in which you practice. This patient has no medical conditions, but has hypotension.**

C1. ALL RESPONDENTS.
To what extent would you be **worried or not** about this patient **developing Sepsis**?
Please click here **[INSERT HYPERLINK TO PATIENT CASE STUDY NUMBER 1 HERE]** *to see the* ***patient case study*** *information again.*

1. Very worried
2. Fairly worried
3. Not very worried
4. Not at all worried
99. Don't know

[SINGLE CODE]

C2. ALL RESPONDENTS.
How likely or unlikely would you be to **apply the Hour-1 Sepsis Bundle to this patient case**?

Please click here **[INSERT HYPERLINK TO PATIENT CASE STUDY NUMBER 1 HERE]** *to see the* ***patient case study*** *information again.*

1. Very likely
2. Fairly likely
3. Neither likely nor unlikely
4. Fairly unlikely
5. Very unlikely
99. I do not know

[SINGLE CODE]

C3. ALL RESPONDENTS.
Which of the following actions, if any, would you take in the **management** of this patient?

Please click here **[INSERT HYPERLINK TO PATIENT CASE STUDY NUMBER 1 HERE]** *to see the* ***patient case study*** *information again.*

1. Measure lactate level
2. Re-measure lactate if the initial level is elevated

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3. Conduct a blood test with cell count
4. Send blood culture to lab
5. Administer broad-spectrum antibiotics
6. Administer maintenance IV fluid
7. Apply vasopressors
8. Correct low blood oxygen levels
9. Monitor early stage urine output
10. Fluid resuscitation
11. I would not apply any of the steps outlined above to this patient's case **[PN: EXCLUSIVE. FIX]**
99. I do not know **[PN: EXCLUSIVE. FIX]**

[MULTI CODE. RANDOMISE. ALWAYS SHOW CODE 2 AFTER CODE 1.]

NEW SCREEN:
[NOTE FOR SCRIPTING: THIS IS PATIENT CASE STUDY NUMBER 2] Now please imagine a separate scenario where a **40-year-old female with diarrhoea, vomiting, a low blood pressure and a low urine output has been admitted to the hospital in which you practice**

C4. ALL RESPONDENTS.
To what extent would you be **worried or not** about this patient **developing Sepsis**?
Please click here **[INSERT HYPERLINK TO PATIENT CASE STUDY NUMBER 1 HERE]** *to see the **patient case study** information again.*

1. Very worried
2. Fairly worried
3. Not very worried
4. Not at all worried
99. Don't know

[SINGLE CODE]

C5. ALL RESPONDENTS.
How likely or unlikely would you be to **apply the Hour-1 Sepsis Bundle to this patient case**?

Please click here **[INSERT HYPERLINK TO PATIENT CASE STUDY NUMBER 2 HERE]** *to see the **patient case study** information again.*

1. Very likely
2. Fairly likely
3. Neither likely nor unlikely
4. Fairly unlikely
5. Very unlikely
99. I do not know

[SINGLE CODE]

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C6. ALL RESPONDENTS.
Which of the following actions, if any, would you take in the **management** of this patient?

Please click <u>here</u> **[INSERT HYPERLINK TO PATIENT CASE STUDY NUMBER 2 HERE]** *to see the* **patient case study** *information again.*

1. Measure lactate level
2. Re-measure lactate if the initial level is elevated
3. Conduct a blood test with cell count
4. Send blood culture to lab
5. Administer broad-spectrum antibiotics
6. Administer maintenance IV fluid
7. Apply vasopressors
8. Correct low blood oxygen levels
9. Monitor early stage urine output
10. Fluid resuscitation
11. I would not apply any of the steps outlined above to this patient's case **[PN: EXCLUSIVE. FIX]**
99. I do not know **[PN: EXCLUSIVE. FIX]**

[MULTI CODE. RANDOMISE. ALWAYS SHOW CODE 2 AFTER CODE 1]

NEW SCREEN. SHOW ALL

You have now reached the end of the survey. Many thanks for your time.

Please be sure to submit your answers.

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Section F: Pharmacovigilance Re-contact

F1. The sponsoring company of this research has an obligation to continuously monitor the safety of their products. Although rare, their Product Safety Department may want to further investigate any issues you may have raised in this survey. If we identify any AE/product complaint mentioned by you during this research, are you willing to be contacted by us to provide more information regarding the adverse event/product complaint?

(Please select one answer only)

o Yes, I am willing to be contacted to provide more information regarding the adverse event/product complaint

o No, I am not willing to be contacted to provide more information regarding the adverse event/product complaint

[PN: SINGLE CODE. SHOW IF CLOSED-END AE TRIGGERED WITHIN SURVEY OR IF OPEN-ENDED QUESTIONS IN QUESTIONNAIRE. FOR OPEN-ENDED QUESTIONS WHICH REQUIRE MANUAL REVIEW FOR AEs, USE F2 FOR OFF-LINE RE-CONTACT OF RESPONDENTS TO ASK FOR CONSENT TO PASS ON PERSONAL DATA TO CLIENT IN ALL MARKETS]

F2. Would you be willing to have your personal data passed on to the sponsoring company for the purpose of obtaining more information regarding any adverse event / product complaints mentioned in this research? Please note that if you were to consent to having your personal data passed on to the sponsoring company, bioMérieux, such personal data will be controlled and processed by their Product Safety Department.

(Please select one answer only)

o Yes, I consent to my personal data being passed on to bioMérieux.

o No, I do not consent to my personal data being passed on to bioMérieux.

[PN: SINGLE CODE. SHOW ONLY IF CLOSED-END AE TRIGGERED WITHIN SURVEY AND 'YES' AT F1; IF NO CLOSED-END AE TRIGGER BUT WITH OPEN-ENDED QUESTIONS WHICH REQUIRE MANUAL REVIEW FOR AEs, USE FOR OFF-LINE RE-CONTACT OF RESPONDENTS TO ASK FOR CONSENT TO PASS ON PERSONAL DATA TO CLIENT AS REQUIRED]

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Appendix

APPENDIX A – REGIONS

UK

1. East England
2. East Midlands
3. London
4. North East
5. North West
6. Northern Ireland
7. Scotland
8. South East
9. South West
10. Wales
11. West Midlands
12. Yorkshire and Humber

FRANCE

13. Auvergne - Rhône-Alpes
14. Bretagne (Brittany)
15. Bourgogne - Franche-Comté
16. Corse (Corsica)
17. Centre - Val de Loire
18. Grand Est (Alsace, Champagne, Lorraine)
19. Hauts de France (Nord Pas-de-Calais - Picardie)
20. Ile de France (Paris)
21. Nouvelle Aquitaine (Aquitaine, Poitou-Charentes, Limousin)
22. Normandie
23. Occitanie (Midi-Pyrénées, Languedoc)
24. Pays de la Loire
25. Provence - Cote d'Azur

SPAIN

26. Andalucía
27. Aragón
28. Principado de Asturias
29. Illes Balears
30. Canarias (ES)
31. Cantabria
32. Castilla y León
33. Castilla-la Mancha
34. Cataluña
35. Comunitat Valenciana

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36. Extremadura
37. Galicia
38. Comunidad de Madrid
39. Región de Murcia
40. Comunidad Foral de Navarra
41. País Vasco
42. La Rioja
43. Ciudad Autónoma de Ceuta (ES)
44. Ciudad Autónoma de Melilla (ES)

SWEDEN

45. Norrbotten
46. Västerbotten
47. Jämtland
48. Västernorrland
49. Gävleborg
50. Dalarna
51. Västmanland
52. Örebro
53. Värmland
54. Uppsala
55. Stockholm
56. Södermanland
57. VGR
58. Östergötland
59. Jönköping
60. Kalmar
61. Kronoberg
62. Halland
63. Skåne
64. Blekinge
65. Gotland

DENMARK

66. Region Hovedstaden
67. Region Sjælland
68. Region Syddanmark
69. Region Midtjylland
70. Region Nordjylland

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NORWAY

71. Northern Norway
72. Trøndelag
73. Western Norway
74. Southern Norway
75. Eastern Norway

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