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Malnutrition in emergency general surgery: a survey of National Emergency Laparotomy Audit Leads

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Abstract

Background: Patients who are malnourished and have emergency general surgery, such as a laparotomy, have worse outcomes than those who are not malnourished. It is paramount to identify these patients and minimise this risk. This study aimed to describe current practices in identifying malnutrition in patients undergoing a laparotomy, specifically focusing on screening, assessment, nutrition pathways and barriers encountered by clinicians.

Methods: Following piloting and validity assessment, anaesthetic and surgical National Emergency Laparotomy Audit (NELA) Leads at hospitals across England and Wales were emailed an invitation to a survey. Responses were gathered using Qualtrics. Descriptive analysis and correlation with laparotomy volume and professional role were performed in SPSSv26. University of Sheffield ethical approval was obtained (UREC 046205). The results from the survey are reported according to the CHERRIES guidelines.

Results: The survey was completed by 166/289 NELA Leads from 117/167 hospitals (57.4% and 70.1% response rates, respectively). Participants reported low rates of nutritional screening (42/166; 25.3%) and assessment (26/166; 15.7%) for malnutrition preoperatively. More than one third of respondents (40.1%) had no awareness of local screening tools; indeed, the Malnutrition Universal Screening Tool (MUST) was used by approximately half of respondents (56.6%). Contrary to guidelines, NELA Leads report albumin levels continue to be used to determine malnutrition risk (73.5%; 122/166). Postoperative nutrition pathways were common (71.7%; 119/166). Reported barriers to nutritional screening and assessment included a lack of time, training and education, organisational support and ownership. Participants indicated nutrition risk is inadequately identified and is an important missing data item from NELA. There was no significant correlation with hospital laparotomy volume in relation to screening or assessment for malnutrition, the use of nutritional support pathways or organisational barriers. There was interprofessional agreement across a number of domains, although some differences did exist.

Conclusions: Wide variation exists in the current practice of identifying malnutrition risk in NELA patients. Barriers include a lack of time, knowledge and ownership. Nutrition pathways that encompass the pre-operative phase and incorporation of nutrition data in NELA may support improvements in care.

KEYWORDS

assessment, emergency general surgery, malnutrition, screening

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Highlights

- Emergency general surgical patients, in particular those who undergo a laparotomy and are malnourished, are at high risk of worse outcomes than those who are not malnourished.
- There is wide variation in current practices in relation to screening and assessment of malnutrition in laparotomy (NELA-eligible) patients.
- A number of barriers to identifying malnutrition in laparotomy patients exist, including a lack of time, training and education, access and ownership of the problem.

INTRODUCTION

There are approximately 22,000 laparotomies annually in England and Wales recorded on the National Emergency Laparotomy Audit (NELA) database.¹ NELA is a prospectively maintained, mandated national database aimed at improving the quality of care for adult (>18 years) patients undergoing emergency laparotomy or laparoscopy for a gastrointestinal (stomach, small or large bowel or rectum) emergency.² Patients with complications after elective gastrointestinal surgery are also included; however, patients who underwent vascular and gynaecological surgery are excluded from the database.

Over time, outcomes including mortality rate have improved and the current 30-day mortality rate after emergency laparotomy is 8.7%.³ However, no nutritional data are recorded on the NELA database despite a well-established association between malnutrition and worse outcomes in patients undergoing emergency general surgery (EGS).⁴⁻⁷ Malnutrition is also associated with increased healthcare costs.^{8,9}

A number of national and international bodies have issued guidelines for identifying and managing malnutrition,¹⁰⁻¹³ including that all patients should be screened for malnutrition on admission to hospital. Those found to be at risk should have a more focused assessment and a management plan devised accordingly.^{14,15} However, a consensus definition for malnutrition is still lacking.¹⁶ In addition, many approaches and tools have been described to identify malnutrition. It is not known which method or tool would be most appropriate to use within the context of EGS,¹⁷ where assessment may be more challenging due to the complexities of the patients involved and acute context.

AIMS

The aim of this study was to explore current practices in identifying malnutrition in NELA-eligible patients, specifically focusing on screening and assessment, nutrition pathways and barriers encountered. Secondary aims were to explore whether current practice differed based on hospital laparotomy volume or professional role completing the survey.

METHODS

A cross-sectional survey was designed with reference to current nutrition guidelines and the existing literature.^{13,18-20} The survey is provided in Supporting Information: Appendix 1. The results from the survey are reported with reference to the CHERRIES guidelines.²¹

Study design

Anaesthetic and surgical NELA Leads are consultants of their respective specialty with extensive experience in perioperative decision-making and assessment.²² It is recommended that every hospital in England and Wales have a NELA Lead who is responsible for overseeing the local audit process. Anaesthetic and surgical NELA Leads for all eligible hospitals that submitted data to NELA's seventh report were invited to complete the survey.

This survey was designed to capture limited demographic data about respondents including their main current clinical role and hospital of work. Respondents were asked detailed information regarding perioperative nutrition screening and assessment. This included questions relating to when it is completed, by whom and the methods used to do so. Use of nutrition pathways and barriers encountered were also explored. The following definitions prefixed their respective sections of the survey:

- *Perioperative nutrition screening*
This refers to a process of identifying patients who may have a malnutrition diagnosis and may benefit from an assessment by an appropriately registered healthcare professional.
- *Perioperative nutrition assessment*
This is a systematic and comprehensive process of evaluating nutrition status by an appropriately registered healthcare practitioner. It would confirm a patient's nutrition risk, the likely underlying cause and develop a nutrition management plan. The process of screening followed by a rigorous assessment may not be embedded within every hospital. Consequently, it was made clear that the assessment of malnutrition

was not dependent on screening for malnutrition having been performed prior, and vice versa.

Ethical approval and informed consent

University of Sheffield ethical approval was obtained (UREC 046205). Potential participants were emailed an invitation to read a participant information sheet which explained the duration of the survey, data stored, study investigators and purpose of the study. Participants provided the survey consent by clicking on a link in the invitation email.

Development and pretesting

The survey was piloted among six general surgeons and two anaesthetists involved in EGS at a single teaching hospital in the United Kingdom. Face validity was assessed using a 'modified QQ-10'.²³ The QQ-10 is a validated tool to assess face validity of patient questionnaires used in healthcare.²³ It was modified to account for this research being directed at participants who are healthcare professionals and not patients (Supporting Information: Appendix 2). In addition, feedback regarding question wording, survey structure and time taken to complete the survey were gathered.

Responses from the pilot study confirmed appropriate question wording. Free text responses advised the need for clearer explanations regarding definitions for 'screening' and 'assessment', which were incorporated in the revised questionnaire. The modified QQ-10 confirmed the survey was relevant, easy to complete and included all aspects pertinent to the practices and pathways in NELA-eligible patients. The mean time to complete the survey was 6 min.

Recruitment and survey administration

Following refinement of the questionnaire, anaesthetic and surgical NELA Leads for all eligible hospitals that submitted data to NELA's seventh report¹ were identified and contacted using the details on the freely available NELA Lead database at the time of the study,²⁴ and responses were gathered using Qualtrics survey software. Only participants invited to the survey were able to complete it. Where an email returned advising they are no longer the NELA Lead and contact details of the current NELA Lead were provided, the new NELA Lead was contacted using the same process. Hospitals that did not have a NELA Lead for either anaesthetics or surgery were excluded from analysis, as were hospitals that reported fewer than 10 laparotomies annually in keeping with NELA's updated outlier policy.²⁵

The study opened in October 2022 for 10 weeks with two additional reminders to complete it. No incentives were offered. Responses were anonymous. Questions were from a drop-down list, a 5-point Likert with a 'don't know' option

or a selection of options from a menu. Instructions to 'select one' or 'select all that apply' were given as appropriate. Questions were adaptively formatted to understand why an event happens or does not happen, with free text boxes also offered. There were up to five questions per page displayed on 17 pages, including the opening and closure pages; a progress bar was visible. Mandatory questions were indicated, and participants were able to review answers.

Analysis

Analyses were performed in IBM SPSSv26. Hospital laparotomy volume was correlated to participant responses using hospital data submitted to NELA's seventh report via Spearman's rank correlation. Associations between professional role and participant responses were determined using appropriate tests of significance, namely Mann-Whitney U and χ^2 tests.

Where multiple responses from a single hospital were obtained, only one response was selected to represent that hospital (Supporting Information: Appendix 3). Briefly, responses to five questions were used. 'I-do-not-know' responses were considered less favourable than any other response, and if required, the more positive response between two participants at the same hospital was chosen. Representative statements from free text data are presented in the findings.

RESULTS

Survey results

Of the 186 hospitals that submitted data to the NELA seventh report, a total of 167 hospitals were contacted. This amounted to contacted hospitals that represented 21,688 laparotomies out of a total of 21,856 laparotomies recorded on the NELA database (ranging from 11 to 364 laparotomies, with a mean of 128 laparotomies per hospital). There were 19 hospitals excluded for submitting fewer than 10 laparotomies per year, being uncontactable, having no active NELA Lead or no longer undertaking EGS (Figure 1). Of the hospitals excluded for recording fewer than 10 laparotomies per year, this included one hospital that performed five laparotomies, one hospital that performed two laparotomies and nine hospitals that did not perform any.

Participant completion rate

A total of 166 responses were obtained from 289 participants, resulting in an overall response rate of 57.4%. The survey was completed by 93 general surgeons, 67 anaesthetists and 6 intensive care physicians. The responses from anaesthetists and intensive care physicians were pooled for subsequent analysis under the label of 'anaesthetists'.

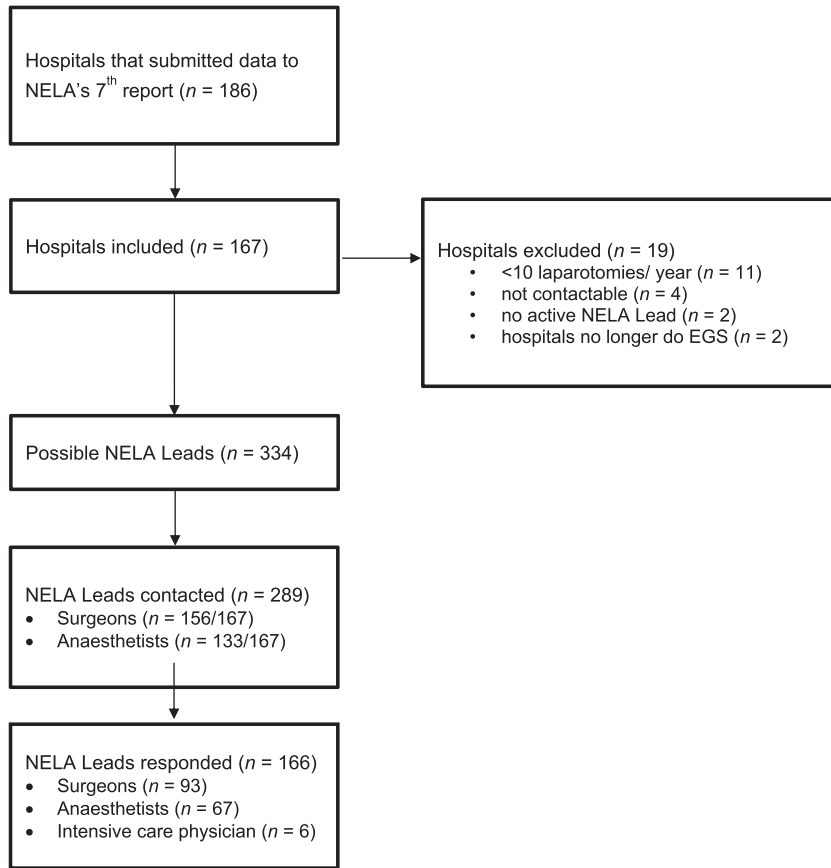


FIGURE 1 National Emergency Laparotomy Audit (NELA) Lead recruitment.

Hospital completion rate

Responses from participants (88 surgeons, 26 anaesthetists and 4 intensive care physicians) at 117/167 (70.1%) hospitals were used to represent hospital-level completion. This accounted for 15,421 laparotomies recorded on the NELA database (ranging from 12 to 364 laparotomies with a mean of 132 laparotomies per hospital). There were 45 hospitals with a response from both an anaesthetic and a surgical NELA Lead.

Perioperative nutrition screening

Screening for malnutrition risk was performed 'regularly' or 'all the time' prior to emergency surgery in only a quarter of cases (42/166), whereas it occurs frequently after emergency surgery (Table 1 and Figure 2). It was performed preoperatively by nurses at 56.9% (70/123) and postoperatively by dietitians (27.2%, 85/312) (Supporting Information: Table S1). A lack of time was the most common reason for not screening preoperatively (50.4%, 66/235), but most were not sure why it was not undertaken postoperatively (31.6%, 36/114) (Supporting Information: Table S2).

The Malnutrition Universal Screening Tool (MUST) was the screening tool of choice although 40.1% (68/166) of respondents did not know which tool was used (Supporting

Information: Table S3). Albumin was the most common marker for malnutrition used by 73.5% (122/166) anaesthetists and surgeons fairly equally, followed by body mass index (BMI; 58.4%, 97/166) and a weight history (55.4%, 92/166) (Supporting Information: Tables S4 and S5). Other body composition and functional methods were rarely used (Supporting Information: Tables S6 and S7).

Perioperative nutrition assessment

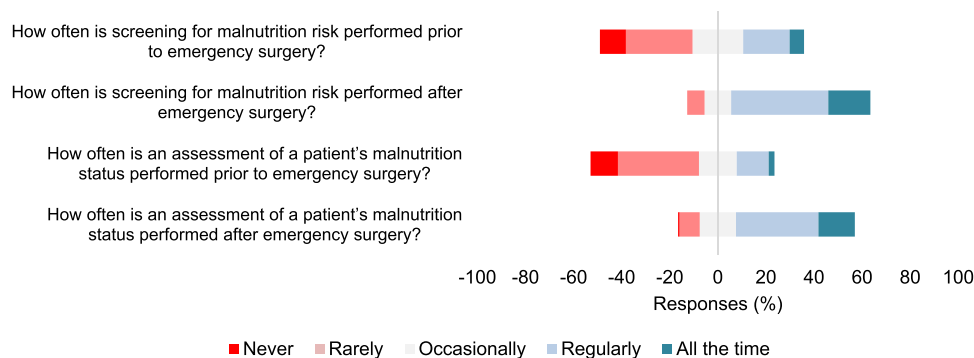
Nutrition support teams (NST) were present in hospitals according to 82.8% (77/93) of surgical NELA Leads (Supporting Information: Table S8). Almost half of participants responded that an assessment of nutritional status was 'never' or 'rarely' performed prior to surgery (45.1%, 75/166), but was undertaken 'regularly' or 'all the time' after surgery (49.4%, 82/166) (Table 1 and Figure 2). When an assessment was performed prior to EGS, it was done so by general surgeons (23.8%) and dietitians (22.3%) (Supporting Information: Table S9). Postoperatively it was performed by dietitians in most cases (32.8%, 100/305) (Supporting Information: Table S9). A quarter of surgeons did not think an assessment of nutritional status would change immediate management preoperatively (24.5%, 35/143), although again a lack of time was the main reason for this not being performed (29.6%, 61/206). A lack of access to an

TABLE 1 Distribution of all participants' responses relating to the frequency of screening and assessment for malnutrition pre- and postoperatively.

Question	Role	Never	Rarely	Occasionally	Regularly	All the time	Don't know
Screening for malnutrition before emergency surgery	A	15.1 (11)	31.5 (23)	16.4 (12)	6.8 (5)	1.4 (1)	28.8 (21)
	S	7.5 (7)	24.7 (23)	24.7 (23)	29.0 (27)	9.7 (9)	4.3 (4)
	T	10.8 (18)	27.7 (46)	21.1 (35)	19.3 (32)	6.0 (10)	15.1 (25)
Screening for malnutrition after emergency surgery	A	0 (0)	6.8 (5)	8.2 (6)	24.7 (18)	6.8 (5)	53.4 (39)
	S	0 (0)	7.5 (7)	11.8 (11)	52.7 (49)	25.8 (24)	2.2 (2)
	T	0 (0)	7.2 (12)	10.1 (17)	40.4 (67)	17.5 (29)	24.7 (41)
Assessment for malnutrition before emergency surgery	A	11.0 (8)	23.3 (17)	9.6 (7)	4.1 (3)	1.4 (1)	50.7 (37)
	S	11.8 (11)	41.9 (39)	20.4 (19)	20.4 (19)	3.2 (3)	2.2 (2)
	T	11.4 (19)	33.7 (56)	15.7 (26)	13.3 (22)	2.4 (4)	23.5 (39)
Assessment for malnutrition after emergency surgery	A	1.4 (1)	4.1 (3)	13.7 (10)	19.2 (14)	5.5 (4)	56.2 (41)
	S	0 (0)	11.8 (11)	16.1 (15)	46.2 (43)	22.6 (21)	3.2 (3)
	T	0.6 (1)	8.4 (14)	15.1 (25)	34.3 (57)	15.1 (25)	26.5 (44)

Note: Responses as % (n).

Abbreviations: A, anaesthetists; S, surgeons; T, total.

**FIGURE 2** Distribution of all responses from surgeons and anaesthetists relating to frequency of screening and assessment for malnutrition pre- and postoperatively.

appropriate person was the main barrier postoperatively (36.4%, 44/121) (Supporting Information: Table S2).

Management of patients identified at risk of malnutrition or malnourished

If a patient was identified as at risk of malnutrition or malnourished, two-thirds of participants indicated there was not a pathway to provide nutritional support preoperatively (63.3%, 105/166). However, three-quarters of participants indicated that there was a pathway postoperatively (71.7%, 119/166) (Table 2). Where participants indicated a pathway did not exist, the majority did not know why this was the case pre- (37.3%, 47/126) or postoperatively (57.7%, 30/52) (Supporting Information: Table S10). Very few participants

indicated it would be because implementing nutritional support would not improve patient outcomes either preoperatively (4.8% 6/126) or postoperatively (1.9%, 1/52) (Supporting Information: Table S10).

Organisational barriers

Participants were specifically asked to indicate what the local difficulties or barriers were in identifying malnutrition risk in this high-risk surgical group. A lack of time in the emergency setting was the most common reason (23.1% 71/307) (Figure 3, Supporting Information: Table S11). However, a lack of training and education (18.2%, 56/307) and a lack of organisational support and clarity regarding who is responsible for managing perioperative malnutrition (16.3%, 50/307) were indicated.

Perceptions regarding overall management

Only one in five participants (32/166) agreed or strongly agreed that malnutrition risk was adequately identified in NELA-eligible patients preoperatively (Table 3 and Figure 4), and this remains less than half postoperatively (45.1%, 75/166). Again, fewer than half of participants had the confidence their team identify and manage EGS patients with malnutrition (48.8%, 81/166). However, a majority of participants indicated that it would be beneficial to have a standard pathway for identifying and managing perioperative malnutrition as it might improve patient outcomes (83.7%, 139/166). A similarly positive response indicated that it would be beneficial to include malnutrition risk as part of the NELA data collection process (71.1%, 118/166) (Table 3 and Figure 4).

Correlation with laparotomy volume

There was a weak negative correlation in perceived adequacy of identifying malnutrition risk in NELA-eligible patients preoperatively and laparotomy volume

TABLE 2 Distribution of all participants' responses relating to the presence of nutrition pathways pre- and postoperatively if a patient was at risk of malnutrition or malnourished.

Question	Role	Yes	No
Pathway to provide nutritional support preoperatively	A	26.0 (19)	74.0 (54)
	S	45.2 (42)	54.8 (51)
	T	36.7 (61)	63.3 (105)
Pathway to provide nutritional support postoperatively	A	61.6 (45)	38.4 (28)
	S	79.6 (74)	20.4 (19)
	T	71.7 (119)	28.3 (47)

Note: Responses as % (*n*).

Abbreviations: A, anaesthetists; S, surgeons; T, total.

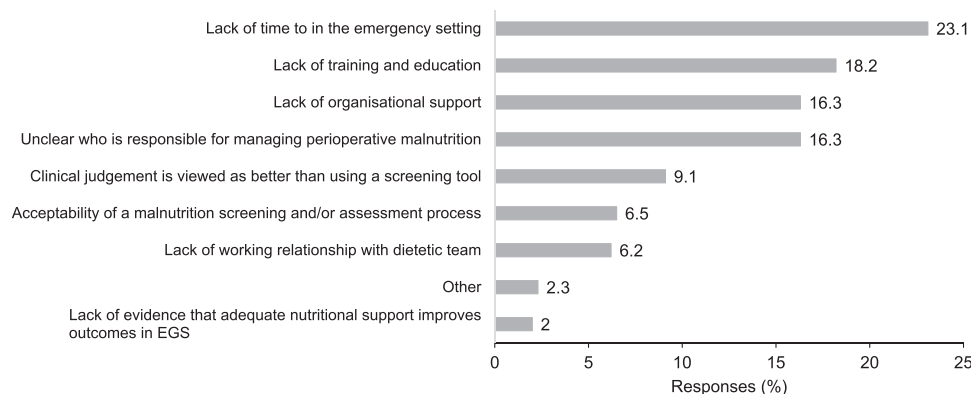


FIGURE 3 Local difficulties or barriers in identifying malnutrition risk in National Emergency Laparotomy Audit (NELA)-eligible EGS patients.

(Spearman's rank correlation, $r = -0.19$ [$-0.360, -0.007$; $p = 0.042$]) (Supporting Information: Table S12). However, there was no significant correlation with hospital laparotomy volume across any other domain, including screening or assessment for malnutrition, the use of nutritional support pathways or organisational barriers (Supporting Information: Table S12).

Association with professional role

Data for hospitals whereby both an anaesthetic and surgical NELA Lead submitted a response are shown in Supporting Information: Tables S13–S15. Participant response did not vary based on professional role for how often an assessment for malnutrition occurs, the overall perception of how adequate malnutrition risk is identified preoperatively or the perceived benefit of including malnutrition risk as part of the NELA collection process (Supporting Information: Table S16). However, differences were evident regarding how often screening for malnutrition occurs before ($n = 76, p = 0.027$) and after ($n = 65, p = 0.029$) surgery; the presence of a pathway for nutritional support before ($n = 90, p = 0.004$) and after ($n = 90, p = 0.020$) surgery; perceptions regarding adequacy of malnutrition identification postoperatively ($n = 90, p < 0.001$); and, confidence that the surgical team can identify and manage patients with malnutrition ($n = 90, p < 0.001$).

Free text comments

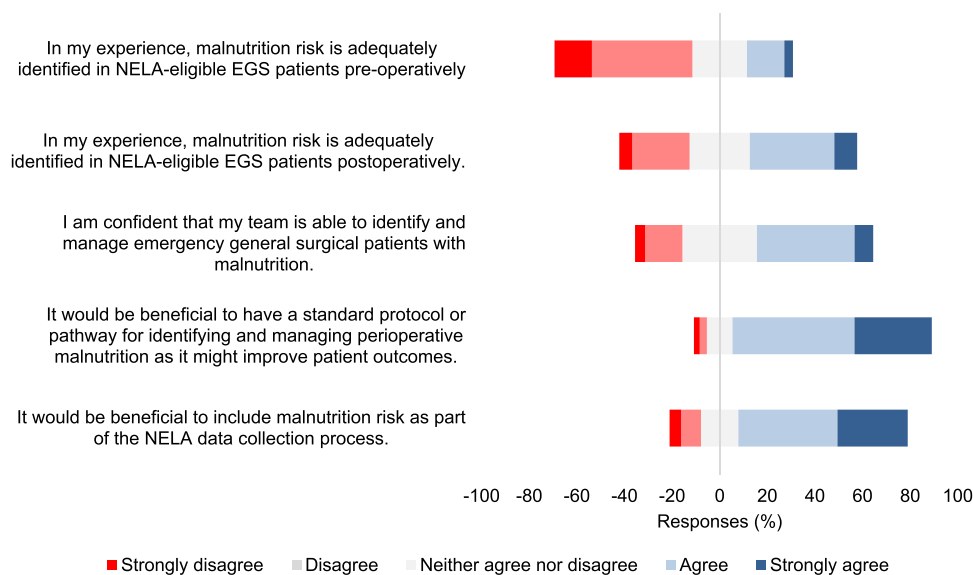
A summary of the free text comments with respect to nutrition screening and assessment pre- and postoperatively is provided in Supporting Information: Table S17. Comments regarding other barriers in identifying malnutrition risk relate to a lack of awareness, access out of hours, financial resources and overall workload.

TABLE 3 Distribution of all participants' responses relating to perceptions of overall management of malnutrition risk in NELA-eligible patients.

Question	Role	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree
In my experience, malnutrition risk is adequately identified in NELA-eligible EGS patients preoperatively	A	16.4 (12)	49.3 (36)	20.5 (15)	9.6 (7)	4.1 (3)
	S	15.1 (14)	36.6 (34)	24.7 (23)	20.4 (19)	3.2 (3)
	T	15.7 (26)	42.2 (70)	22.9 (38)	15.7 (26)	3.6 (6)
In my experience, malnutrition risk is adequately identified in NELA-eligible EGS patients postoperatively.	A	6.8 (5)	34.2 (25)	38.4 (28)	15.1 (11)	5.5 (4)
	S	4.3 (4)	16.1 (15)	15.1 (14)	51.6 (48)	12.9 (12)
	T	5.4 (9)	24.1 (40)	25.3 (42)	35.5 (59)	9.6 (16)
I am confident that my team is able to identify and manage emergency general surgical patients with malnutrition.	A	6.8 (5)	21.9 (16)	39.7 (29)	27.4 (20)	4.1 (3)
	S	2.2 (2)	10.8 (10)	24.7 (23)	51.6 (48)	10.8 (10)
	T	4.2 (7)	15.7 (26)	31.3 (52)	41.0 (68)	7.8 (13)
It would be beneficial to have a standard protocol or pathway for identifying and managing perioperative malnutrition as it might improve patient outcomes.	A	1.4 (1)	2.7 (2)	9.6 (7)	49.3 (36)	37.0 (27)
	S	3.2 (3)	3.2 (3)	11.8 (11)	52.7 (49)	29.0 (27)
	T	2.4 (4)	3.0 (5)	10.8 (18)	51.2 (85)	32.5 (54)
It would be beneficial to include malnutrition risk as part of the NELA data collection process.	A	5.5 (4)	9.6 (7)	17.8 (13)	37.0 (27)	30.1 (22)
	S	4.3 (4)	7.5 (7)	14.0 (13)	45.2 (42)	29.0 (27)
	T	4.8 (8)	8.4 (14)	15.7 (26)	41.6 (69)	29.5 (49)

Note: Responses as % (n).

Abbreviations: A, anaesthetists; EGS, emergency general surgery; NELA, National Emergency Laparotomy Audit; S, surgeons; T, total.

**FIGURE 4** Distribution of responses relating to perceptions in the overall management of malnutrition risk in National Emergency Laparotomy Audit (NELA)-eligible patients.

DISCUSSION

This national survey of NELA Leads in England and Wales reports considerable variation in current practices in relation to screening and assessment of malnutrition in NELA-eligible patients.

Screening is a process of identifying patients who may have a diagnosis of malnutrition. All patients should be screened for malnutrition on admission to hospital and weekly thereafter in the United Kingdom.¹³ Similar to other studies, only a quarter of participants responded that routine screening for malnutrition is performed

prior to surgery.²⁶ Participants may not have been aware that it has been performed or may not use it in any subsequent decision-making process, as it is typically considered a task undertaken by nurses. Additionally, the outcome of the nutrition screening may not be readily available to clinicians for various reasons during the decision-making process, and this may affect the answers provided in this study. Although it is surprising 40.1% of participants did not know which screening tool was used in their hospital, the MUST is the most commonly used tool and is currently recommended by NICE.¹³

MUST has been validated in many populations and settings.²⁷ A score of 2 or more indicates a patient is at high risk of being malnourished, and this should trigger a referral to the dietitian or the NST for an assessment. This study identified that although NSTs are recommended,^{13,28} they are not ubiquitous, similar to previous findings.^{28,29} NELA-eligible patients may be at high risk due to the acute nature of their disease and absence of any nutritional intake for more than 5 days¹⁷; MUST may not be appropriate in this cohort. An alternative to screening is to refer all patients to the dietetic service or NST for an assessment; however, this would likely be beyond workforce capacity. Although MUST was not originally validated in NELA patients, higher scores have since been shown to correlate with time without enteral nutrition.¹⁷

Patients not screened for malnutrition may not be referred for an assessment in a timely manner. We know there is a delay in referring patients for consideration of nutritional support.³⁰ This may explain why fewer-than-expected participants reported nutritional assessments are undertaken routinely, particularly preoperatively. A lack of time, access, training and perception that it does not alter the immediate management were common reasons why screening or an assessment was not performed.

Albumin was the most used marker of malnutrition by 73.5% of participants, despite national and international guidelines advising the contrary.^{11,13,20,31,32} Although albumin does correlate with surgical outcomes and is collected on the NELA database for this reason, it reflects the acute disease and inflammation rather than malnutrition. It is not recommended to be used as such.¹³ Patients with a normal albumin level may still have severe malnutrition resulting in terrible outcomes; relying on this blood test as a marker of malnutrition in the acute setting is ill advised.

Participants also frequently used BMI and a weight history to identify malnutrition. These can be difficult to ascertain objectively in the EGS setting, yet often constitute a criterion in screening tools such as MUST. The increase in global obesity may also potentially reduce the usefulness of these markers. The presence of hidden micronutrient deficiencies in this population is well described. More research is required to understand the impact of obesity on surgical management and outcomes in this context.^{33,34}

Interestingly, body composition and functional methods were rarely reportedly used to identify malnutrition, nor were computerised tomography (CT) scans, yet more than

90% of patients undergo a preoperative CT scan according to NELA data.¹³ Measuring reduced muscle mass using CT is one criterion for a diagnosis of malnutrition using the Global Leadership in Malnutrition (GLIM), guidelines which are recommended internationally.¹¹ Additionally, studies have shown that measuring sarcopenia via CT is a valid method in EGS patients, and that sarcopenic patients have a 1-year mortality rate of 57% after emergency laparotomy.³⁵ The use of routine CT imaging to inform decision making requires further research.

This study highlighted several common barriers in identifying malnutrition in NELA patients. A lack of time in the EGS setting was expected. Interestingly, however, others included a lack of training and education, a lack of organisational support and lack of clarity regarding who is responsible for managing perioperative nutrition. This will require more systemic and cultural changes. Although identifying malnutrition in all patients admitted to hospital is every clinician's responsibility, there need to be clear processes to ensure this is done and acted on effectively. The vast majority (83%) of participants believe 'nutrition pathways' may improve patient outcomes, yet in the mainstay these do not exist preoperatively. This reflects findings mirrored in operatively managed patients with small bowel obstruction, whereby nutritional support is more likely to be considered postoperatively than preoperatively.³⁶ A small number of 'early recovery pathways' have been implemented with difficulty in EGS.^{37,38} These have been associated with reduced mortality, although not specifically due to optimising nutritional care.³⁹

Differences in variation in screening and assessment of malnutrition within NELA-eligible patients is not related to hospital laparotomy volume. Only one participant response was selected to represent a hospital where multiple responses had been received, and this may have introduced selection bias. Case volume has previously been shown not to correlate with dietitian review or use of parenteral nutrition.⁷

Associations between participant responses and professional subtype were also analysed. Key differences pertained to frequency of screening, the presence of nutritional pathways and perceptions related to the adequacy of identifying, and confidence with managing, malnutrition. Anaesthetists are typically only involved with EGS patients in the perioperative period only, and this may explain these differences.

This national study benefits from comparatively high completion rates at both clinician and hospital levels, which are higher than similar studies.^{26,40-42} It was piloted locally, included both anaesthetic and surgical NELA Leads and correlated responses with contemporaneous hospital laparotomy volume. However, this study is not without limitations. First, screening and assessment of malnutrition is a dynamic process that should continue throughout a patient's admission. Although not captured in this study, reassessment is likely to represent a smaller proportion of those patients

who are screened and assessed initially. Second, this study was focused on perioperative nutrition for NELA-eligible patients. However, there will be other high-risk EGS groups that are malnourished or at risk of being malnourished and not captured on the NELA database, for example, nonoperatively managed patients with small bowel obstruction¹⁷ or acute pancreatitis. Third, the details of nutrition pathways were not assessed as it was beyond the scope of the study. There may be a role for developing a national pathway for this patient cohort which incorporates current guidelines.

Given the variation in practice, and relative blind spot in current care and audit, policy makers might consider the inclusion of nutritional status in routine datasets such as NELA; our study showed this had wide support. This would allow correlations with outcomes at a population level. Professional associations should consider the highlighted issues regarding awareness and education of nutritional management of the EGS patient. Educational materials should be provided to aid this, and consideration should be given to roles for dietitians in the acute surgical setting to support best practice.

Researchers should consider the limited awareness and expert skills in the EGS setting when designing research on the topic. Feasibility work may be needed to ensure any proposed intervention is deliverable. Qualitative research exploring clinicians' understanding of who is malnourished, why this is the case, when to intervene and how this changes surgical management are future research areas.

CONCLUSION

This study shows variation in current practices of identifying malnutrition within NELA-eligible patients. Several barriers exist and include a lack of time, training and education, access and ownership of the problem. Future directions include developing consensus 'nutrition pathways', developing routine data linkage to enable correlation with patient outcomes and exploring the process around clinicians' decision making.

AUTHOR CONTRIBUTIONS

Daniel L. Ashmore: Conceptualisation; data curation; formal analysis; investigation; methodology; project administration; visualization; roles/writing—original draft; writing—review and editing. **Timothy Wilson:** Supervision; visualization; writing—review and editing. **Vanessa Halliday:** Methodology; supervision; visualization; writing—review and editing. **Matthew Lee:** Methodology; supervision; visualization; writing—review and editing.

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CONFLICT OF INTEREST STATEMENT

The authors declare no conflict of interest.

DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available from the corresponding author upon reasonable request.

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PEER REVIEW

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SUPPORTING INFORMATION

Additional supporting information can be found online in the Supporting Information section at the end of this article.

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