Original Article

Described Practices for Assessing Fluid Resuscitation in Acute Hospital Care: A Qualitative Study

E Lloyd, A Ignatowicz, E Sapey, D Lasserson & A Seccombe

Abstract

Fluid resuscitation is a widely-used treatment in acute and emergency medicine, however, the process used to perform a fluid assessment has never been studied. This qualitative study explored how acute physicians describe their approach to assessing for fluid resuscitation. 18 clinicians of varying grades consented to a semi-structured interview. Transcripts were coded and analysed using thematic analysis. Participants described three subtypes of assessment; screening assessment, emergency assessment and formal assessment. Whether a patient was 'sick' was key to determining which assessment they would receive. Marked heterogeneity was noted in the assessment processes, particularly regarding the use of history-taking. Further research is required to determine how the information gathered in these assessments is used to decide when fluid resuscitation is indicated.

Keywords

Fluid assessment, fluid resuscitation, acute medicine, thematic analysis, qualitative

Key points

- Three subtypes of fluid assessment were described: screening, formal and emergency.
- The screening assessment was performed on most, if not all, inpatients and was comprised of an 'end of the bed' inspection and/or a brief review of the observations.
- The emergency assessment was performed on any patient considered to be 'sick' and was an abbreviated fluid assessment which was closely linked to the ABCDE assessment.
- The formal assessment was triggered by certain presenting complaints and/or comorbidities and, for many interviewees, was the archetypal fluid assessment.
- Despite being highly regarded as an assessment tool, history-taking was frequently omitted when assessing acutely-unwell patients. This contradiction warrants further exploration.

Introduction

Fluid resuscitation describes a rapid administration of intravenous (IV) fluid to improve venous return to the heart. In hypovolaemic shock, it is lifesaving.[1] However, the administration of fluids can also be harmful with NICE guidelines reporting IV fluid-associated morbidity in one in five hospital inpatients.[5] To ascertain whether IV fluid is needed, clinicians are trained to perform a fluid assessment, which is seen as a key competency for all grades, from medical students to specialist trainees.[2-4] Two key guidelines aim to support clinicians in assessing a need for IV fluid: the 2013 National Institute for Health and Care and Excellence (NICE) IV fluid guidelines[5] and the Royal College of Physician (RCP) Acute Care Toolkit 12.[6] Their algorithms for fluid assessment suggest history taking, clinical examination, observations and clinical monitoring, and laboratory investigations. While specific criteria using systolic blood pressure, heart rate, capillary refill time, respiratory rate, NEWS (national early warning score), and a passive leg raise are recommended in both guidelines to identify hypovolaemia, several of these criteria have been described as unreliable[7] and non-specific.[8] Furthermore, assessing for hypovolaemia is complicated by the effects of age, multimorbidity, medications, and acute illness, which are not accounted for in most published guidelines.[8]

In addition, evidence suggests that fluid assessment is underperformed by clinicians. A recent multi-centre audit found that only 54.3% of acute kidney injury cases had any documentation regarding fluid status within 24 hours of admission.[9] No studies to date have described the 'real-life' assessment processes used by clinicians, and how they compare with the guidelines, or explored the degree of heterogeneity that exists between clinicians.

Understanding how fluid assessment is currently performed will support the development of practical guidelines to help with the judicial use of these therapies.

This study aimed to explore descriptions of assessments for fluid resuscitation in an acute medical setting, with a focus on the processes involved.

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Methodology

A semi-structured topic guide was developed to explore how clinicians performed an assessment for fluid resuscitation. The guide used an initial exploratory approach and progressed to targeted questions covering four key components of a fluid assessment: history, examination, observations and investigations. The project was registered as an educational study at a single NHS site, so did not require HRA or ethical review. It was approved by the local NHS R&D office: RRK6288.

Clinicians of different grades from a West Midlands teaching hospital, who assessed and prescribed IV fluids as part of their job, were interviewed. The topic guide was piloted with two junior doctors. No significant changes were made, so the pilot data were included in the analysis. The remaining clinicians were chosen using criterion sampling. Recruitment was stopped once saturation had been reached.

An undergraduate student with no clinical experience of fluid assessment conducted the interviews. He received appropriate training and supervision prior to and during the study. Each interview lasted between 10 and 20 minutes and was audio-recorded. Interviews were transcribed using Trint® online transcription software[10] and then checked for accuracy by a member of the study team.

Thematic analysis was conducted using Braun and Clarke's six-stage process.[11] Initial coding was performed separately by three authors (AS, AI, EL). Codes were developed both inductively from data and deductively by looking for descriptions of the processes surrounding fluid assessment across all interviews. Codes were then built into broader themes iteratively using serial comparisons between transcripts. Two-weekly meetings were held to discuss coding, themes and interpretations of data. Direct quotes from clinicians were used to support the findings following anonymisation.

Results

18 clinicians were interviewed in total. Two were part of the pilot study. A further four clinicians were recruited from each of the following grades: foundation year, core trainee, specialist trainee, and consultant. Table 1 summarises the seniority of the included clinicians.

Three categories of fluid assessment were described by all participants: a 'screening' assessment, a 'formal' assessment, and an 'emergency' assessment.

1. Screening Assessment

A screening assessment was a brief check, performed on most, if not all, hospital patients. It was not prompted by a specific trigger. The vast majority of interviewees felt all patients should be assessed in this way on admission.

One clinician went further and suggested that such a fluid assessment should be performed "on every patient who's here [in hospital], every day." (Dr M).

For some, this assessment was composed of a limited number of observations, particularly "blood pressure [and] heart rate" (Dr I). For others, a screening assessment was simply an inspection from the "end of the bed" (Dr Q).

The purpose of the screening assessment was to act as a trigger for a subsequent, more detailed assessment if concerns were highlighted.

Blood pressure held particular significance. One interviewee suggested it was key to what happened next: "Is the patient hypotensive? That's probably the first question I'd want to ask myself." (Dr L)

Some interviewees noted a screening assessment could be performed by non-clinical roles, particularly the nursing team who highlighted sick patients.

Nurses were also considered to be more reliable than the documentation of fluid intake.

2. Formal Assessment

A 'formal' assessment was prompted by a broad list of triggers that related to the patient's presenting complaint and comorbidities.

The assessment collected information from history, examination, observations and, if needed, investigations. Despite recognising that the interview was specific to fluid resuscitation, interviewees frequently described a 'formal' fluid assessment in the context of scenarios that would warrant maintenance or replacement IV fluid regimes (i.e. for patients who were not sick).

Two subtypes of formal assessment were described: 'clerking' and 'ward round'. It was unclear whether these subtypes were chosen due to personal preference or according to the situation envisaged. Seniority of clinician did not affect which subtype was described.

A 'clerking' approach followed a traditional approach to patient assessment, starting with history, then examination, observations and, if required, investigations.

In a 'ward round'-based approach, an initial impression was created by reviewing medical notes,

Table 1. The different grades of clinicians interviewed and their anonymised labels.

Grade of Doctor	Consultant	Speciality Trainee	Core Trainee	Foundation Year
Doctors	A, B, C, D	E, F, G, H	I, J, K, L, M, N	O, P, Q, R

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Table 2. Screening assessment – example quotes

Screening assessment discussed in the interviews	Example quote
Screening assessment as a brief check, performed on most hospital patients	"Well I'd do a fluid assessment on every patient I treat. Some will be more cursory than others..." (Dr O) "I would assess anyone that comes in front of me in hospital. Those people in Acute Medicine are by definition sick enough to be in hospital, so they should be [fluid] assessed." (Dr J)
Screening assessment as composed of a limited number of observations	"In everybody...we'd look at blood pressure, heart rate..." (Dr I) "...even if it's just from the end of the bed, getting a grasp of how they look...is always a good way of assessing for fluid." (Dr Q)
Screening assessment as a trigger for a subsequent, more detailed assessment	"I would actually do a quick fluid assessment on all of my patients generally speaking...And if there were cause for concern...I would obviously then go into a more detailed, formal assessment." (Dr N)
Screening assessment performed by non-clinical team members	"Nurses especially are the first ones to flag up the sick patient often." (Dr J) "The nursing staff in particular are probably the key people in this [fluid assessment] and they usually highlight patients they think are not tolerating the fluids or not drinking as much as they should do, and they flag that up." (Dr Q) "We're not very good at documenting fluid intake so I find, personally, it's much more...useful to ask the nurse." (Dr L)

observations and investigations. Then a focused history and examination was performed to confirm this impression.

Observations were mentioned by all interviewees, irrespective of how they performed a formal assessment. They were frequently described as prompting a fluid prescription, raising questions about the function of the remaining pieces of data that were collected.

Those who described a 'ward round'-based approach, expressed a preference for checking the observations before seeing the patient because they gave a numerical value, which was dependable and more accurate.

Clinical signs were also mentioned by all interviewees, often as a long list.

The lists were remarkably similar and included: capillary refill, skin turgor, jugular venous pressure, pulse volume, character, and rate, mucous membranes, sunken eyes, dry axilla, lying and standing blood pressure, auscultation of the heart and lungs, sacral/peripheral oedema, swollen abdomen, cerebral function, conscious level, temperature, and sweating. Most interviewees closely associated clinical signs with a formal assessment. One interviewee talked about clinical signs as if they alone could define the formal assessment: "First of all, obviously, clinical signs…" (Dr G).

Only seven of the interviewees mentioned history-taking when first asked about how they performed a fluid assessment. However, once prompted, all interviewees said they included history in their assessment. The importance of history was linked to the identification of a diagnosis: the cause of the potential hypovolaemia. Specific questions were mentioned concerning symptoms connected to fluid input or loss. Recognition was also given to relevant comorbidities and medications.

Blood tests were the most common investigation mentioned by interviewees when a formal assessment was being discussed and were linked to dehydration.

3. Emergency Assessment

An 'emergency' assessment was described for 'sick' patients. Many interviewees asked for clarification or qualified their answers to reflect a clear distinction between a formal fluid assessment – often described simply as a "fluid assessment" – and an emergency assessment. Emergency assessments were triggered by the screening assessment described above. The most common trigger was hypotension, either in isolation or with a tachycardia. Of note, these observations were used to define both hypovolaemia and shock, terms that were used interchangeably throughout the interviews.

Closely aligned to an emergency assessment was the ABCDE acronym,[1] which was mentioned by all but two interviewees. Interviewees either made clear they would use an ABCDE approach to assess for fluid resuscitation or requested clarification about

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Table 3. Formal assessment – example quotes

Formal assessment discussed in the interviews	Examples quotes
Formal assessment as performed on patients identified by a broad list of triggers but not 'sick' patients	"[I would consider a fluid assessment] If I'm dealing with a patient who has... got an underlying infection..." (Dr G) "If I knew the patient had significant cardiac or renal comorbidities, I would always consider [a fluid assessment]." (Dr L)
A 'clerking' approach	"History first, then physical examination, then biochemical testing." (Dr D) "If it's not an emergency situation, then you could start with history taking and then go on to examination after." (Dr I)
A 'ward'-based approach	"I've already got a picture in my head before I go and see the patient." (Dr Q) "We'll have a look through the notes, make sure we know what's going on. Have a look through the observations, have a look at the medications...create a hypothesis about what you think is wrong...then clinically assess the patient with a preformed idea of what you've got in your head." (Dr C)
Observations, clinical signs, history taking as aspects of performing formal fluid assessment	"Start by generally looking at the patient...have they got dry mucous membranes...skin turgor...heart rate...blood pressure...jugular venous pressure... listening to the heart...listening to the lungs...peripheral oedema...urine output... sunken eyes" (Dr I) "I'd ask patients about how much they've been drinking...are they managing to keep down any oral fluids that they're taking." (Dr E) "History of recent diarrhoea or...sickness...history of any skin burns, poor water intake, lack of appetite. (Dr A)
Blood tests as the most common investigation	"There's plenty of markers of dehydration that we'd pay attention to from the bloods." (Dr O) "Evidence of renal failure or...dehydration." (Dr I)
Reverting to describe a 'formal' assessment for fluid resuscitation in the context of scenarios that would benefit from maintenance or replacement IV fluid regimes	"So fluid resuscitation for me has two elements. There's the acute element of fluid resuscitation whereby someone is dehydrated or hypotensive and we have to act quite quickly to increase the fluid volume in order to bring their blood pressure up to a happy level. And then the other element of resuscitation for me is when patients either are slightly dehydrated in what they can take in orally or they have a pre-existing deficiency and we need to set up a fluid regime over a period of time to supplement what they take in orally." (Dr Q)

whether it was necessary. One interviewee stated he would do an "ABCDEFG" (Dr J) assessment and then laughed, suggesting it was so routine that it had become a cliché and a source of humour.

There was general consensus that an emergency assessment was a shortened version of a formal fluid assessment and, therefore, finished without full appreciation of the facts. In several interviews, history-taking was specifically mentioned as something that would be omitted. One interviewee described choosing between an ABCDE assessment and history-taking depending on whether the patient was stable or sick: "If I'm not worrying about patient's clinical status, so…the patient's stable, I have time to take a history. In these circumstances [a sick patient], I would probably go for ABCDE rather than history-taking." (Dr H). Clinical examination was also limited, with some interviewees stating they would only perform a single sign instead of a complete clinical examination.

In contrast, observations were always included of an emergency assessment. Blood pressure and heart rate were the most frequently mentioned measurements, but urine output was also commented upon. Most saw a low urine output as an indicator that fluid resuscitation might be required, but one interviewee saw it as a sign that the patient cannot get rid of fluid and, therefore, a risk factor for fluid overload. For them, it had become a reason to be cautious about giving fluid.

In contrast to a formal assessment, bedside investigations (e.g. ultrasound) or invasive tests (e.g.

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Table 4. Emergency assessment – example quotes

Formal assessment discussed in the interviews	Example quotes
Distinction between a formal fluid assessment and an emergency assessment	"When they're in shock, or fluid assessment?" (Dr C) "Is the patient sick? If they're particularly sick, then I go to the bedside, if not I look through their results." (Dr J)
Hypovolaemia and shock used interchangeably	"So, there are a few presentations in which we do a fluid assessment. First of all, if someone has come in with shock: if there is low blood pressure and increased heart rate." (Dr K)
ABCDE approach for assessing patients for fluid resuscitation	"So, it's [hypovolaemia] an acute emergency...you actually start with the airway...then go to breathing...and then circulation, and that's where you start to address hypovolaemia." (Dr I) "...does the patient need an ABC assessment?" (Dr L)
Emergency assessment as a shortened version of a formal fluid assessment	"You just rely on a few pieces of information when a patient is very sick in front of you." (Dr A) "If he's really unwell then the history will have to come a bit later." (Dr K) "I find it [clinical examination] is not particularly helpful in assessing volume status apart from cap refill." (Dr C)
Low urine output as an indicator that fluid resuscitation might be required	"I'd try and assess how unwell they were in general, because if they were unwell then I'd use a standardised approach...looking specifically at the blood pressure and heart rate." (Dr E) "[If] they're not passing urine, they're at quite high risk of going into fluid overload." (Dr I)

pulmonary wedge pressures) were suggested for emergency assessments.

4. Complexity and heterogeneity

Throughout the interviews, two overarching themes emerged concerning the process of fluid assessment. First, a fluid assessment was seen as complex and challenging because of the number of variables that were involved. This made it difficult to describe. In addition, there was an acceptance that the process was heterogeneous, which was overtly described by several interviewees, both for the same clinician in different scenarios as well as between clinicians (see table 4).

There was also wide variation in how frequently each of the NICE hypovolaemia criteria[5] were mentioned. Blood pressure was mentioned by all 18 interviewees and heart rate was mentioned by 15. The other four criteria were much less frequently mentioned (capillary refill – 6; respiratory rate – 3; NEWS – 1; passive leg raise – 4). No interviewee mentioned all six criteria.

Several factors that might contribute to this heterogeneity were mentioned during interviews. As well as patient factors, these included clinician-related factors, e.g. the speciality, and environmental factors, e.g. the setting or workload. Time pressures meant some interviewees were not able to perform a fluid assessment and instead performed a rapid "ballpark" assessment or occasionally did not performed an assessment.

Discussion

This qualitative study explored how clinicians described fluid assessments performed in acute care and is the first study of its kind in any speciality or setting. Three categories of assessment were described. A 'screening' assessment was performed on all hospital inpatients to ascertain whether further assessment was required. An 'emergency' assessment was performed on 'sick' patients and was linked to acute scenarios, particularly hypovolaemia and shock. A 'formal' assessment was performed on patients who were not sick but whose fluid status might be abnormal. Of note, no interviewee referenced a guideline directly or described an assessment process advocated by a guideline. In addition, the NICE definitions for shock and hypovolaemia were not used or commented upon by any interviewee.

The phrase "fluid assessment" was often used to describe a formal assessment. In this sense, a formal assessment was described as the archetypal fluid assessment. This may explain why interviewees often described scenarios not appropriate for fluid

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Table 5. Complexity and heterogeneity – example quotes

Complexity and heterogeneity discussed in the interviews	Example quotes
Fluid assessment as complex and challenging process	"...there are many conditions which can cause and affect patients' fluid balance in both directions." (Dr I) "It [fluid assessment] is difficult to pin it down to one thing really." (Dr Q)
Fluid assessment as a heterogeneous process	"You use whatever tools you feel to be useful at the time at which you see the patient. And sometimes you ignore some things and acknowledge other things based on what you see in front of you. There's no one way of doing it as far as I'm concerned." (Dr C) "...everyone has their own way of doing that. I think there's no hard and fast rule to it [fluid assessment]." (Dr N) "In reality, I think everyone does a mix of what's at hand." (Dr J)
Fluid assessment as context specific process	"There's obviously a lot more to it [fluid resuscitation] depending on the speciality, depending on the patient." (Dr O) "...[in intensive care] assessing IVC filling and...straight leg raising but I've never seen those used on the ward." (Dr E)
Rapid "ballpark" assessment or IV fluid without an assessment at all	"It's pretty ballpark to be honest because we're too busy to do it any other way." (Dr O) "There's a lot of times that fluids are prescribed, and no one is coming to review the patient." (Dr K)

resuscitation despite repeated reminders.Being sick was the overriding factor in determining which assessment process a clinician would follow (Figure 1). Data collected during the screening assessment, particularly blood pressure, was closely related to whether a patient was considered to be sick. Being sick was not binary as interviewees noted different degrees of being sick. For example, any patient "sick enough to be in hospital" received a screening assessment, whereas "particularly sick" patients

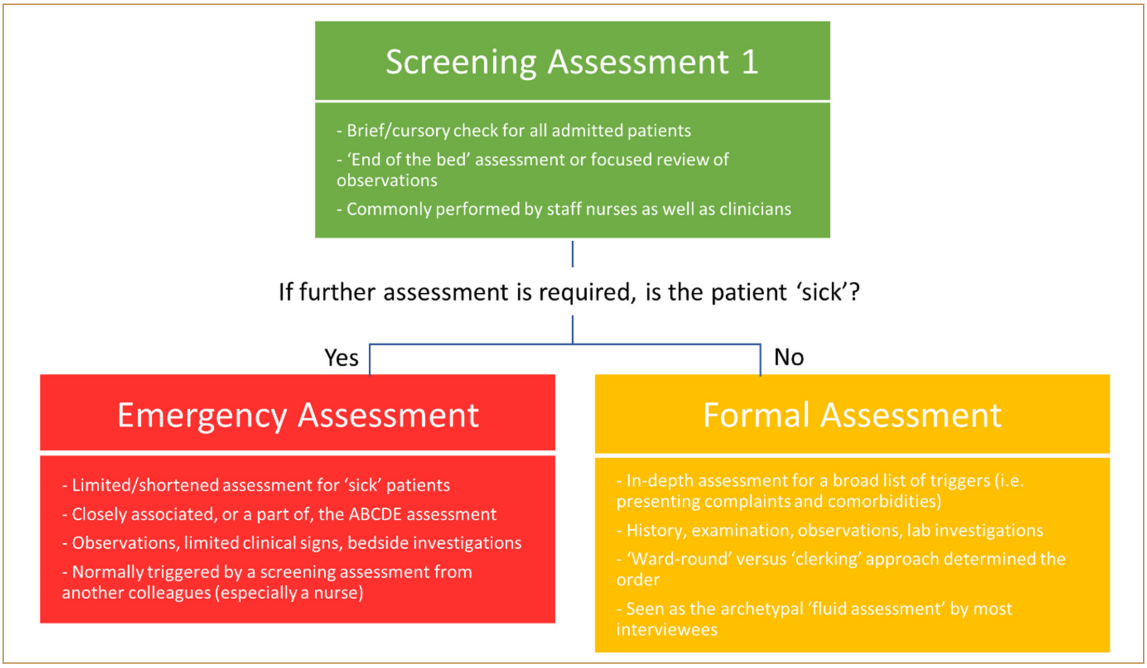

Figure 1. A fluid assessment process model. Clinicians use a screening assessment to judge whether the patient is sick. If they are sick, the clinician proceeds to an emergency assessment. If they are not sick. the clinician performs a formal assessment, usually as part of a wider assessment process.

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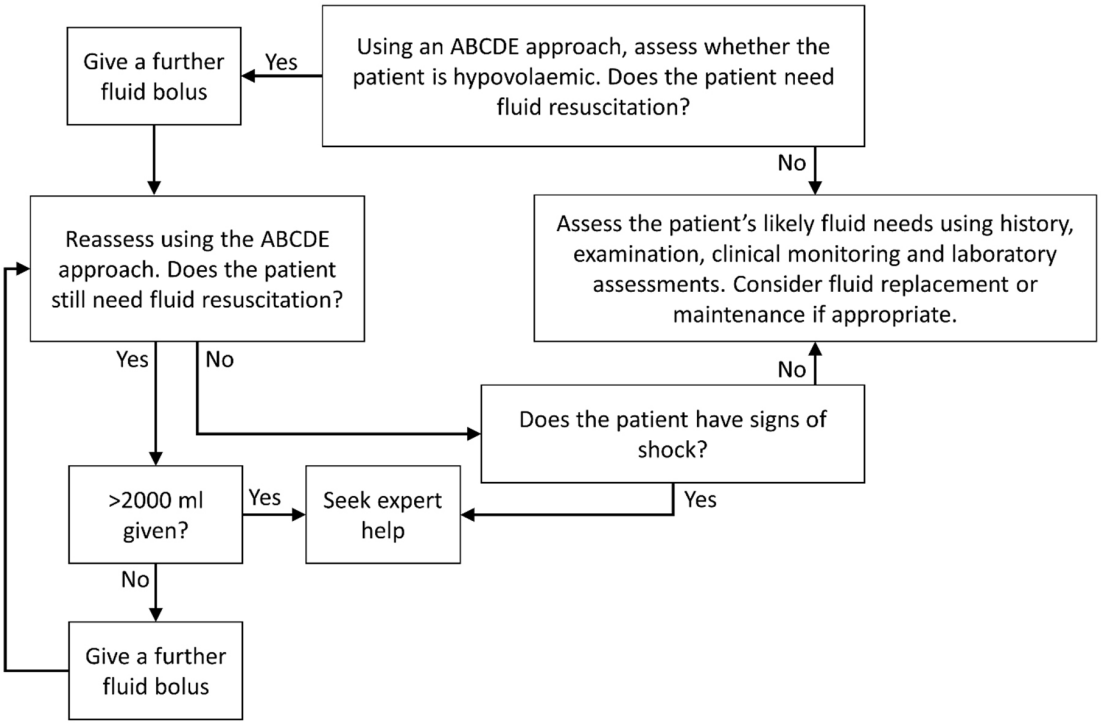

Figure 2. How to assess for fluid resuscitation according to UK guidelines. Both NICE CG174[5] and the RCP Acute Toolkit 12[6] advocate the use of an ABCDE assessment to identify a need for fluid resuscitation. A broader fluid assessment is subsequently advised to identify a need for fluid replacement and maintenance once shock/hypovolaemia has been excluded or treated.

received an emergency assessment. The process used to determine when a patient was sick was never described.

Underlying the processes were two overarching themes: complexity and heterogeneity. Both themes were overtly commented upon, but also manifested themselves indirectly. Complexity was seen through the uncertainty voiced by interviewees as well as requests for clarification. Heterogeneity manifested itself through varied responses to the same questions and through contradictions: both between clinicians and for the same clinician. Three justifications for this heterogeneity were noted: patient characteristics (e.g. presenting complaint and comorbidities), environmental factors (e.g. setting and workload), and clinician factors (e.g. speciality). Seniority did not affect the fluid assessment process described.

Two parts of a fluid assessment were repeatedly mentioned by interviewees: an ABCDE assessment and history-taking. Given the ABCDE assessment is taught to all grades of doctor,[1] its emphasis likely reflects the trained belief that all patients who are acutely-unwell should have an ABCDE assessment. To support this idea, many interviewees listed parts of the ACBDE assessment that were unrelated to fluid assessment as if programmed to do so.

A similar emphasis on ABCDE assessment when assessing for fluid resuscitation is seen in national guidelines. Rather than simply reminding the clinician of its importance, the NICE guidelines[5] and the RCP IV fluid toolkit[6] make the ABCDE assessment an integral part of the fluid assessment process (Figure 2). This differs from guidelines for other acute medical emergencies. The ABCDE assessment is not mentioned in either the NICE or the SIGN asthma guidelines,[12,13] for example, and while the NICE acute upper gastrointestinal bleeding guidelines comment that the "principles of 'airway, breathing and circulation' apply", it is not included in any of the subsequent algorithms.[14] It is unclear why fluid assessment, in particular, should have such a strong connection to the ABCDE assessment.

Of all modes of assessment, it was history-taking that generated the most contradiction. On one hand, all interviewees described history-taking as a vital part of the fluid assessment process once prompted. This belief likely arises from the continued emphasis of the importance of history-taking from medical school through to specialty training[2-4] and raises questions about whether history-taking should have a great emphasis during fluid resuscitation assessment. On the other hand, history-taking was frequently omitted, both intentionally (from the 'emergency' assessment process) and unintentionally (11 interviewees did not mention it until prompted). One interviewee suggested that, if the patient was unwell, they could replace history-taking

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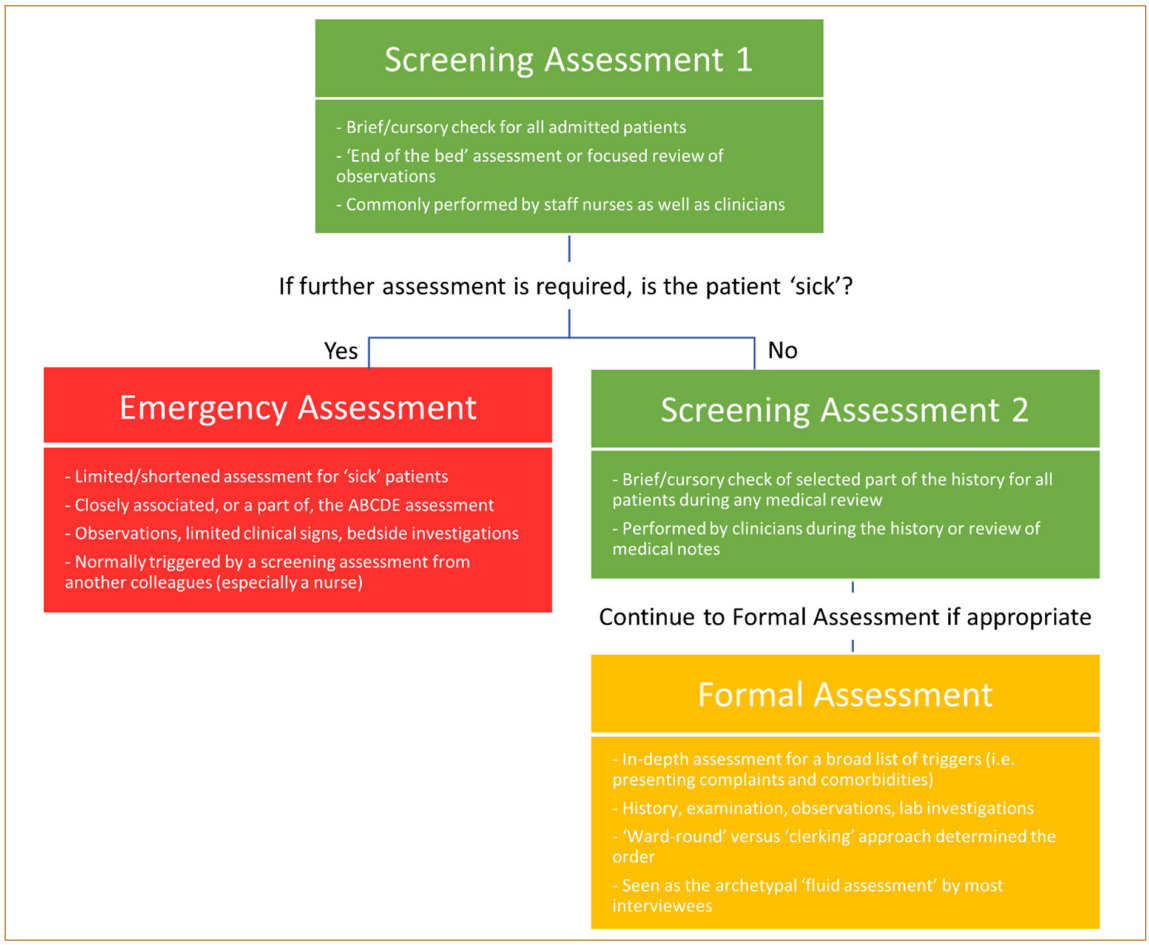

Figure 3. An alternative fluid assessment process model. This alternative algorithm recognises that the triggers for a formal assessment are not identified during a screening assessment. Instead, they are identified during a patient review or clerking.

with an ABCDE examination, as if the two were interchangeable.

The reason for the contradiction between the stated importance of history-taking and the failure to mention it when describing acute scenarios was unclear. It may reflect practical difficulties in obtaining a history from acutely-unwell patients or a concern about delaying treatment. However, most acutely-unwell patients are able to answer focused questions in a timely manner. Instead, the contradiction may have been caused by the variations in how terms were interpreted by interviewees, leading to confusion regarding the scenarios that were envisaged. One example of this was the frequent description of non-emergency scenarios despite consistent use of the term 'fluid resuscitation'.

Finally, the contradiction may represent a clash between the two predominant approaches to assessing and managing an acutely-unwell patient: the algorithm-based ABCDE approach, which excludes history-taking, versus the traditional clerking approach, which starts with history-taking. These two approaches can be seen in the NICE fluid assessment algorithm (Figure 2).[5] An ABCDE assessment is recommended if the patient is hypovolaemic, whereas history-taking is only recommended once hypovolaemia (perhaps a proxy for the sick patient) has been excluded, as if the two are mutually incompatible.When history-taking was described, it was used to identify triggers (e.g. presenting complaint or comorbidities) for a formal assessment. Because these pieces of information were not identified during a screening assessment, it implies the formal assessment was not directly related to the screening assessment. This supports an alternate model for the relationships between the described fluid assessment processes (Figure 3).

A strength of the study is its inclusion of perspectives from a range of clinicians with different experiences of fluid assessment. This enabled us to capture a wide collection of views and contributed to the richness of the data. What is more, the inclusion of an experienced qualitative researcher in the analysis allowed us to challenge some of the assumptions that are taken for granted when discussing fluid assessment. However, the study was carried out in a single-site. Therefore, these results may not have captured the views and processes used by clinicians

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working in other hospitals. Furthermore, the interviews were focused on fluid resuscitation. So, it is uncertain whether the above models describe all fluid assessment processes used by clinicians. This study leaves several unanswered questions that warrant further exploration, e.g. how do clinicians identify a sick patient and how is the relevant terminology used and interpreted by clinicians. In addition, while this study has described two possible models to summarise the fluid assessment process, it is unclear how the gathered information is then used. Therefore, further work is needed to explore the decision-making process that follows an assessment for fluid resuscitation.

Conclusion

Fluid assessment is a common but complex process. This study proposes the existence of three different types of fluid assessment. Furthermore, it describes two possible models of how these different types of fluid assessment are related. Whether or not a patient was sick was key to determining the type of assessment performed. The importance of history-taking was unclear, but contradictions in how it was described may suggest a clash between two different approaches to assessing a patient: an algorithm-based ABCDE assessment and a traditional clerking assessment. Whether this clash is seen elsewhere in acute hospital care is unclear.

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Conflicts of Interest

The authors have no conflicts of interest to declare

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