Development of an ambulatory care pathway for hyperglycaemia

Hyperglycaemia is a feature of diabetes that can be treated by ambulatory emergency care (AEC), thereby avoiding hospital admission. Could an ambulatory hyperglycaemia pathway help? The idea for such a pathway was explored in a study involving 24 nurses and doctors working in diabetes care at St Helens and Knowsley Teaching Hospitals Trust. This article describes the study, its outcomes and the pathway that was approved by the acute medical unit AEC team and forwarded to the endocrinology team for approval. Following feedback, the next phase will be to pilot the pathway.

The American Diabetes Association (2014) defines diabetes as a group of metabolic diseases characterised by hyperglycaemia resulting from a loss of insulin-secreting cells (type 1 diabetes) or insulin resistance or insufficient pancreatic insulin production (type 2 diabetes). Hyperglycaemia is a well-recognised risk factor for hospital-related complications, prolonged hospital stays and mortality (Islam et al, 2015).

In its global report on diabetes, the World Health Organization (2016) stated that, if diabetes is not well managed, it can lead to serious complications, disability and premature mortality, together with a significant financial cost. Good diabetes management has been shown to reduce the risk of complications (Diabetes UK, 2016).

Cost of diabetes
The scale and cost of hospital admissions of patients with diabetes is considerable: one in seven hospital beds is occupied by someone with diabetes (Diabetes UK, 2016). Those who have it are almost twice as likely to be hospitalised than those without, and around 87% of inpatients with diabetes are admitted as an emergency (Allan, 2014).

Keywords
Hyperglycaemia/ Ambulatory care/Diabetic ketoacidosis
those for which earlier and more-effective ambulatory care would avoid or reduce the need for hospitalisation (NHS England, 2014). Exploring ACSCs is important given current socio-demographic trends, such as the ageing of the population and the rise in the number of people living with long-term conditions (Dantas et al, 2016).

Published by the Ambulatory Emergency Care Network (2018), the Directory of Ambulatory Emergency Care for Adults identifies emergency conditions and clinical scenarios that have the potential to be managed in an ambulatory way. Hyperglycaemia, which is considered an ACSC, is listed among those conditions.

In 2013, St Helens and Knowsley Teaching Hospitals Trust created an AEC unit in which, outpatients when possible receive the same emergency care as inpatients but are treated as day cases. The AEC unit delivers a range of treatments that were traditionally administered in the inpatient setting, such as care of deep vein thrombosis, pulmonary embolism and cellulitis. Patients can be referred to the AEC unit by their GP, a walk-in centre or the accident and emergency department.

Hyperglycaemia pathway
Before the research project, the acute medical unit’s (AMU) AEC unit did not have a standardised ambulatory pathway for managing patients presenting with hyperglycaemia. In discussions during an AMU governance meeting, the team identified that such a pathway could potentially improve service provision. It could guide decisions about, and timing of, diagnosis, interventions, follow-up, escalation of treatment, and referral to inpatient care if needed, thereby improving the quality of patient care (National Institute for Health and Care Excellence, 2016).

The decision was made to conduct a study to assess the need for an ambulatory hyperglycaemia pathway. A literature search was carried out using Google Scholar, Medline and the search engine of Liverpool John Moores University to identify material published between 2010 and 2017. Articles, including systematic reviews and meta-analyses, were mostly from peer-reviewed journals. The review also covered trust guidelines and policies, and NICE guidance.

Study methods
The research was conducted using a mixed-methods approach (Parahoo, 2014). Mixed methods have become increasingly popular in health-related research, as they allow a deeper understanding of complex human phenomena (Doyle et al, 2016) and increase the credibility of results (Sahin and Naylor, 2017). The researcher used a questionnaire to collect quantitative data and one-to-one semi-structured interviews to collect qualitative data. This approach provided a more holistic feel to the study, along with more accurate and comprehensive data.

Questionnaire responders (n=22) and interviewees (n=5) were purposively sampled. Three interviewees also completed the questionnaire, making a total of 24 participants; all had experience in diabetes management. Purposive sampling allows a range of views to be identified but there is a risk the researcher may unintentionally show bias towards participants (Parahoo, 2014).

After gaining gatekeeper approval for the study, the researcher sent an email containing an introductory letter and information sheet to invite staff to participate. To be eligible, staff had to:
- Work in the trust’s AMU and/or GP assessment unit;
- Be a registered staff nurse, advanced nurse practitioner (ANP), diabetes specialist nurse (DSN), consultant or junior doctor.

In total, 30 eligible members of staff were recruited.

![Fig 1. Questionnaire responses](image-url)
Study approval was granted by the Liverpool John Moores University research ethics committee and the hospital trust. Participants were informed they could withdraw at any time if they wished and were assured that their confidentiality would be protected at all times.

**Questionnaire**

As well as questions on participants’ roles and qualifications, the questionnaire contained six statements (shown in Fig 1) about their attitudes towards an ambulatory hyperglycaemia pathway. Staff were asked to rate these on a 5-point Likert scale to indicate to what extent they agreed or disagreed.

To ensure reliability, the questionnaire was guided by the review of the literature and the knowledge of experts on the diabetes team. It included a section on requesting participants’ consent and was sent to them along with an addressed envelope so that responses could be returned anonymously. It was completed in April and May 2017.

**Interviews**

The interviews took place during May 2017 on a ‘first come, first served’ basis. After obtaining informed consent from participants, the researcher (first author) conducted and recorded the interviews. Each interview lasted approximately 10-20 minutes; open-ended questions (Box 1) were used to explore participants’ perceptions.

Data saturation was achieved after five interviews. The interviews were transcribed verbatim and analysed using thematic analysis, as recommended by Braun and Clark (2006), to identify and explore emerging patterns and themes.

**Questionnaire results**

Of the 30 potential participants, 22 completed the questionnaire, giving a response rate of 73%. Five were ANPs, one was an endocrinology consultant, four were junior doctors, two were DSNs and 10 were registered staff nurses. Fig 1 shows their responses to the six statements. In brief:

- 17 out of 21 ‘agreed’ or ‘strongly agreed’ there was a need for an ambulatory hyperglycaemia pathway;
- 19 out of 21 ‘agreed’ or ‘strongly agreed’ a pathway would help reduce unnecessary hospital admissions;
- 14 out of 22 ‘agreed’ or ‘strongly agreed’ that specialist input was needed for the ambulatory management of hyperglycaemia;
- 20 out of 21 ‘agreed’ or ‘strongly agreed’ that the pathway would help discharge patients on the same day with an appropriate referral.

Participants were also asked to specify perceived obstacles to the implementation of the ambulatory pathway.

Eighty-one per cent thought there was a lack of standardised institutional policies and insufficient clinical resources (such as endocrinologists, DSNs, etc) to develop an ambulatory pathway for hyperglycaemia.

**Interview results**

The five interviewees comprised two ANPs, two DSNs and one endocrinology consultant. The thematic analysis produced 10 sub-themes and three main themes (Table 1). To ensure validity, these themes were discussed with, and validated by, the researcher’s supervisor.

**Ambulatory management and standardisation of care**

All interviewees considered an ambulatory hyperglycaemia pathway a useful and high-quality management aid: “It seems [a] good initiative to develop an ambulatory pathway for hyperglycaemia management. The benefit of that is the patients can be seen quickly and safely discharged with no delays in care.” (Participant 1)

Most interviewees thought the lack of a standardised pathway could lead to unnecessary hospital admissions and an uncoordinated approach to patient management:

“...I think that it is an important pathway to develop because lots of people who are admitted could have been discharged, but because there is no pathway for the management of such patients, they end up staying in hospital overnight.” (Participant 2)

**Inadequate resources and staffing levels**

Challenges around developing an ambulatory hypercalcaemia pathway included inadequate resources and staffing levels. Most interviewees identified the lack of out-of-hours support from the diabetes specialist team as one of the main challenges:

“The pathway is a good idea if there is the manpower and the support behind it. So, for example, the pathway that […] you have developed at the moment […] falls down in some places because there isn’t enough support to back it up, like diabetes nurses’ support.” (Participant 3)

“I think in order [for the pathway] to work properly, there needs to be more resources.” (Participant 4)

Some participants mentioned the lack of availability of trained staff and the lack of a rapid-access clinic as crucial issues:

“...There will be a lack of nurses […] trained in educating […] people about diabetes and also things like blood-glucose monitoring. So out of hours, because we haven’t got such resources,”

Table 1. Themes emerging from the thematic analysis

<table>
<thead>
<tr>
<th>Main theme</th>
<th>Sub-theme</th>
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<tbody>
<tr>
<td>Ambulatory management and standardisation of care</td>
<td>Quality of care</td>
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<td>Reduction in hospital admissions</td>
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<td></td>
<td>Early discharge</td>
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<td>Inadequate resources and staffing levels</td>
<td>Lack of resources</td>
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<td></td>
<td>Lack of out-of-hours support from the diabetes specialist team due to staff shortages</td>
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<td>Lack of staff training</td>
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<td>Lack of provision for rapid-access clinic</td>
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<td>Resistance due to fear of consequences</td>
<td>Problem defining criteria</td>
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<td>Resistance from diabetes specialist team</td>
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<td>Emotions</td>
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**Box 1. Interview questions**

- What is your opinion about the development of an ambulatory pathway for hyperglycaemia management?
- What limitations do you think are evident concerning the development of an ambulatory hyperglycaemia pathway?
- What is your opinion about the criteria for the ambulatory management of hyperglycaemia?
- Do you have any suggestions for the development of the ambulatory pathway for hyperglycaemia?
**Clinical Practice**

**Research**

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Fig 2. **Assessing patient suitability for ambulatory emergency care**

**CONFIRM HYPERGLYCAEMIA**

| Random blood glucose >11.1mmol/L |

**INITIAL BLOOD INVESTIGATIONS**

- Venous blood gas
- Plasma glucose
- Full blood count
- Urea and electrolytes
- Liver function tests
- C-reactive protein
- Glycated haemoglobin (HbA1C)

**SUITABILITY FOR AEC**

- Consider DKA if two or more of the following are present:
  - Blood ketones >3mmol/L
  - Urine ketones >2 or venous pH<7.3
  - HCO₃⁻<15
  - Blood sugar >11.1mmol/L
  - Admit to enhanced care
  - Use DKA pathway (adult)

- Consider HHS if all of the following are present:
  - Blood sugar >30mmol/L
  - Ph>7.3 and HCO₃⁻>15
  - Blood ketones <3mmol/L
  - Signs of dehydration
  - Admit to enhanced care
  - Use HHS pathway (adult)

If DKA and HHS have been ruled out and the patient is clinically well and is not vomiting, check whether any of the following exclusion criteria are present

- ≥1 exclusion criteria present
  - Admit for inpatient care
- No exclusion criteria present
  - During working hours*: refer patient to the diabetes specialist nursing team
  - Outside working hours*: use the management algorithm on page 2

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*Working hours: Monday-Friday 8am-8pm; weekends 8am-4pm.

DKA = diabetic ketoacidosis; HHS = hyperosmolar hyperglycaemic state; MEWS = Modified Early Warning Score.

Source: Adapted from St Helens and Knowsley Teaching Hospitals Trust (2018)

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**Clinical Practice**

**Research**

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"It may be difficult to implement this pathway." (Participant 2)

"It is important for [patients] to have the information leaflet and the education. There should be a provision for these patients to have a review in a rapid-access clinic, or [for] setting up a rapid-access clinic for all." (Participant 1)

Most interviewees thought a multidisciplinary approach with the diabetes team was crucial for the pathway to be a success: "To facilitate this, it will need to be done jointly with the diabetes team; obviously extending the hours of the diabetes specialist nursing team may be useful." (Participant 2)

"Having a good partnership with the diabetes team and diabetes specialist nurses is key, really." (Participant 5)

**Resistance due to fear of consequences**

Some interviewees thought implementation of the pathway would be challenging: "I will be concerned about the people going home on a Friday if there was no support until the following Monday.

I would worry about having people coming in […] but we haven’t got that back up in place to support [them].” (Participant 4)

Some interviewees suggested the pathway should have precise exclusion criteria to ensure patient safety: "Patients admitted or presenting with diabetic ketoacidosis [DKA], they shouldn’t be included in the pathway, and hyperglycaemic hyperosmolar state patients shouldn’t be [either], [nor] patients with other multiple comorbidities such as acute kidney
Clinical Practice
Research

Injury, ischaemic heart disease or congestive cardiac failure, frailty patients and patients with mental illness.” (Participant 1)

Some expressed the view that it was difficult to define strict criteria as it could be hard to confirm patients’ diabetes type: “It is very hard to confirm diabetes and the textbook version isn’t always what it appears, so you can have a DKA patient whose blood ketones are not necessarily above 3 and is acidic [...] you know, we see different variations to what’s [...] in the textbook or the guidelines... We actually, you know, don’t need pathways... especially for newly-diagnosed type 1...” (Participant 3)

One participant also indicated that there would be no need for a pathway if DSNs could see patients on the same day.

Discussion
Standardised protocols and guidelines in clinical areas are important to reduce the risk of management errors (Noble-Bell and Cox, 2014) and changes are needed to improve the consistency of patient care (Gopee and Galloway, 2009). Health professionals participating in this mixed-methods study agreed there was a need for a clear and comprehensive ambulatory pathway to standardise the care for patients with diabetes presenting with hyperglycaemia.

However, the study also identified barriers to such a pathway, including inadequate resources and staffing levels, and a lack of availability of the diabetes specialist team out of hours. Participants made clear the need for adequate support from DSNs and diabetes link nurses. DSNs help to improve clinical outcomes and prevent complications in people with diabetes, as they are skilled in the use of different medications and devices and are, therefore, able to tailor treatment to the individual (James, 2014). The study also showed that training and education are essential to providing optimal care to patients with diabetes who have hyperglycaemia (Rubin et al, 2007).

Another barrier was participants’ concerns regarding patient outcomes after discharge. The participating DSNs were concerned about diabetes emergencies, patients with multiple comorbidities, frail older patients and patients who are unwell. One idea was to introduce strict exclusion criteria for the pathway to ensure patient safety, but some participants stressed the difficulty in defining such criteria, as the diabetes type is not always obvious. These findings show the limitations of ambulatory care for complex patient cases.

The study outcomes reflect the views of a small sample of health professionals and are not representative of the views of health professionals in general. In addition, they may have been influenced by the selection bias caused by the purposive sampling method. Further research is also needed to ascertain patients’ views about ambulatory care for hyperglycaemia.

Progress and next steps
The literature review did not reveal an existing appropriate tool, so, in collaboration with the specialist diabetes team, the researcher developed an ad-hoc pathway based on the available evidence and on the study data. It contains two sections: the first assesses patients’ suitability for AEC (Fig 2), the second outlines management in type 1 and type 2 diabetes. In working hours, patients who are found to be suitable are referred to the diabetes specialist nursing team; outside of working hours, patients are treated as recommended in the ‘management’ section of the pathway.

The pathway has been approved for use in the AMU and forwarded to the endocrinology team for final approval. Following feedback, the next phase will be to pilot the pathway.

Conclusion
A standardised approach to care is required to promote quality and consistent, important and ambulatory care pathways are important tools for delivering high-quality care to patients with diabetes who present with hyperglycaemia. This study has shown that, to ensure the effective implementation of an ambulatory hyperglycaemia pathway, multidisciplinary collaborative working and organisational measures, such as training staff and recruiting more nurses with specialist knowledge, are needed.

References
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National Institute for Health and Care Excellence (2016) Diabetes in Adults. nice.org.uk/qs6

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