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- To be aware of the limitations of trigger-based escalation systems in acute hospitals
- To identify a potentially new, focused approach to escalation in acute services
- To understand the important role of community-based services in relieving pressure on acute care providers

# Development of a hospital early warning score to end 'escalation fatigue'

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**Abstract**

The Antrim Area Hospital Early Warning Score (HEWS) is an innovative method of assessing the level of pressure on an acute hospital site. It combines eight indicators to produce a score from 0 to 49, which is mapped to an escalation category, ranging from low to extreme pressure. The top two categories, 'severe' and 'extreme', have a corresponding range of escalation actions across service areas.

This article explains why the Antrim Area HEWS was developed and the issues it sought to address, including 'escalation fatigue' among staff because of the normalisation of high alert status. The article includes an analysis of Antrim Area HEWS data collected over one year. It discusses the benefits of the Antrim Area HEWS including: the provision of a simple, objective method for assessing site pressure; increased awareness of site pressure among various service areas; enhanced staff support and understanding of the need for effective escalation; and the development of a focused and meaningful approach that has overcome the escalation fatigue associated with previous escalation frameworks.

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**Keywords**

management, nursing care, professional, service improvement, staff welfare, workforce, workforce planning

ACUTE HOSPITAL services across the UK are operating in an increasingly complex and challenging environment. The demand on services is increasing, with rises in the number of both attendances at emergency departments (EDs) and inpatient admissions (Baker 2017). This increased pressure on services is compounded by the UK's demographic trend towards an ageing population (Office for National Statistics 2018), characterised by multifaceted patient needs and co-morbidities. Workforce challenges add to this pressure, with significant staffing shortages in various healthcare professions (Department of Health Northern Ireland 2018, Beech et al 2019). These pressures are further exacerbated

by the strained financial climate, with budgets not increasing in line with service demand. Instead, ongoing efficiencies and savings are required to ensure that care continues to be delivered and services provide optimal value for money (Smith et al 2014, Lafond et al 2016).

These challenges represent a significant risk, potentially having an adverse effect on patient safety, quality of care and patient experience. Evidence has shown that care quality can be compromised when healthcare organisations have to cut back services to 'core' diagnostic and treatment activities, meaning that other important aspects of care are not provided (Robertson et al 2017).

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Similarly, low levels of well-being affecting staff have been linked to suboptimal patient outcomes and experience (Sizmur and Raleigh 2018). Healthcare professionals often come under extreme pressure as they attempt to manage the gap between demand and capacity by working additional hours and with increasing intensity (Robertson et al 2017).

In this pressured environment, human error is more likely to occur because staff do not always have adequate time, energy and support to undertake their duties effectively (Carayon and Gurses 2008, Hall et al 2016). This has a negative effect on patient safety, increasing risk and potential harm (Cimiotti et al 2012, Hall et al 2016).

In the context of these challenges, experiencing pressure is the norm for staff in acute care settings. However, in some such circumstances staff experience unusually high levels of pressure, for example, at certain times of year, during outbreaks of infectious disease or in emergencies. To preserve patient safety and quality of care, it is essential for staff in acute hospitals to be able to identify when they are in a period of extreme pressure.

### Escalation policies and status tools

To identify periods of extreme pressure, most hospitals in the UK have escalation policies that indicate when intensified effort is required to cope (Back et al 2017). Escalation status is usually assessed based on triggers relating to demand, capacity and system flow, such as increased ED activity, delays in ambulance turnaround or high bed occupancy (Royal College of Emergency Medicine 2015). The identified escalation status then leads to actions that are aimed at responding to and de-escalating pressure, and ensuring site safety and service continuity (Boyle et al 2012, Back et al 2017). While escalation policies are well established across acute hospital sites, at times they fail to achieve their intended results because they do not adequately differentiate between typical variation in pressure and periods of extreme pressure. As a result, 'high alert' often becomes the norm, which detracts from the meaningfulness of the status, undermining its purpose (Kershaw 2018).

To overcome this issue, the Antrim Area Hospital Early Warning Score (HEWS) was developed as a service improvement tool in the Northern Health and Social Care Trust in Northern Ireland. Rather than using escalation triggers, the Antrim Area HEWS uses a numerical score from 0 to 49, based on eight indicators.

This score is mapped to escalation categories from low to extreme pressure, with each category associated with corresponding escalation actions. This article outlines why and how the Antrim Area HEWS was developed, the components of the tool, and the benefits it has provided for the trust since its implementation.

### Escalation issues at the site

Before the Antrim Area HEWS was developed, the Antrim Area Hospital site was using a green/yellow/amber/red escalation framework. The escalation status of the site was assessed using a list of 14 triggers including ED triage time, inpatient bed availability, predicted intensive care unit (ICU) capacity and the availability of community care packages.

When the hospital was in amber or red status, regular escalation meetings were chaired by members of senior management to assess and respond to the situation. This escalation framework had significant limitations. For example, information on all 14 triggers was not readily available, which meant that full implementation of the framework required a significant amount of extra information to be obtained. Since this was not always practicable, the assessment of pressure tended to be subjective, based on ED activity and bed capacity.

Another issue was that the average bed occupancy at the Antrim Area Hospital site is more than 95%, meaning that its escalation status was rarely below amber and was red for much of the winter. Continuous amber or red status led to 'escalation fatigue', which is commonly experienced by staff in acute hospital sites where a high alert status becomes normalised, consequently reducing the usefulness of amber or red status as a trigger for particular actions (Kershaw 2018).

Meanwhile, the development of a site coordination model in Antrim Area Hospital had removed the need for escalation meetings. In this model, one person is in overall charge of the hospital from 8.30am to 8.30pm, seven days a week. This coordinator is based in a central hub, and chairs two-hourly capacity meetings, focusing on site safety and system flow.

This model enabled a proactive response to increasing pressure so there was no need for additional escalation meetings. However, there was still a need for an appropriate system-wide response at times of extreme pressure, and the escalation framework was not providing this effectively.

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### Development of the early warning score

The Antrim Area HEWS was developed with the following objectives:

- » It should be based on information about the hospital site that is readily available, and that was preferably already being gathered as part of the site coordination model.
- » It should be simple and quick to use, but sufficiently holistic to consider issues across the Antrim Area Hospital site.
- » It should be calibrated to the Antrim Area Hospital site, so that higher levels of escalation are triggered only at times of severe or extreme pressure.
- » It should have clear, objective boundaries between escalation levels, so there is no ambiguity about the status of the hospital site.
- » Higher escalation categories should trigger clear, effective actions.

The Antrim Area HEWS was developed using a plan-do-study-act methodology, with the Antrim Area Hospital's site coordinators acting as a test and reference group. Each version of the Antrim Area HEWS was trialled by the site coordinators, who made comments and suggestions that informed the next version. Initial versions of the tool focused on the number of patients in the ED and predicted bed capacity, but this was thought to be too narrow a view of the pressures experienced by the hospital site. Therefore, the number of indicators used was increased to eight, including information on nurse staffing and delayed transfers of care, to ensure that the tool was sufficiently holistic.

The site coordinators set the Antrim Area HEWS scoring thresholds based on their experience and using historical data. For example, hourly ED occupancy data from 1 October 2016 to 30 September 2017 were used to identify how often various occupancy levels were experienced in the ED. For scoring purposes, these data were split into six bands (Table 1). This provided the scoring thresholds for one of the indicators in the HEWS scoring matrix: total number of patients in the ED.

### Components of the early warning score tool

Figure 1 shows the Antrim Area HEWS matrix. This tool measures the following eight indicators:

- » Total number of patients in the ED.
- » Total number of patients in the ED resuscitation area.
- » Longest wait to see an ED clinician.
- » Total number of patients in ED with a decision to admit.

- » Predicted bed capacity until the next morning, based on projected admissions and discharges.
- » Number of available ICU beds.
- » Number of medically fit complex discharges in the hospital.
- » Number of band 5 nursing shifts not covered for the coming night.

The criteria are scored and weighted as shown in Figure 1, resulting in a total score between 0 and 49. This score is then mapped to one of five escalation levels from green (low pressure) to black (extreme pressure) (Figure 1).

An important part of implementing the Antrim Area HEWS was to develop and agree effective actions to be taken when higher escalation levels were reached. A series of workshops and other engagement exercises, such as participating in team meetings, produced a total of 73 actions across 26 service areas, including community hospitals, mental health and other non-acute services inside and outside the trust. These actions were allocated to either severe or extreme status, and included: reprioritising work, reviewing elective activity, shortening the approval process for community care packages, sending alerts to local nursing home providers and using social media to keep the public informed of the situation.

Antrim Area HEWS scores are calculated every day at Antrim Area Hospital's two-hourly site coordination meetings. Once the escalation level reaches severe or extreme, the site coordination team sends out alerts by email and text message, so that services can respond appropriately. Services are expected to implement their agreed actions on receiving

### Key points

- To preserve patient safety and quality of care, acute hospitals must be able to identify when they are under severe or extreme pressure
- The Antrim Area Hospital Early Warning Score (HEWS) is a quick, objective method of assessing pressure in acute hospitals
- The Antrim Area HEWS enables focused and meaningful escalation actions to be triggered only when appropriate

**Table 1. Frequency of emergency department occupancy scores (October 2016-September 2017)**

Score	Number of patients in the emergency department	Frequency	Percentage of total
0	0-19	1,537	18%
1	20-29	1,611	18%
2	30-39	1,924	22%
3	40-49	1,672	19%
4	50-59	1,218	14%
5	60+	798	9%
	Total	8,760	

Figure 1. Antrim Area Hospital Early Warning Score matrix

DATE				TIME				
Indicator	Value	Scoring – part 1						Score
		0	1	2	3	4	5	
Total in ED		<20	20-29	30-39	40-49	50-59	60+	
Total in ED resuscitation area		0	1	2	3	4	>4	
Maximum time to see a clinician (hours.minutes)		<1.20	1.20-1.59	2.00-2.59	3.00-3.59	4.00-4.59	5.00+	
DTAs in ED		<5	5-9	10-14	15-19	20-24	25+	
SUBTOTAL								/20
Indicator	Value	Scoring – part 2					Score	
		0	5	10	15	20		
Net bed capacity		>0	0 to -9	-10 to -19	-20 to -29	≤ -30	/20	
Indicator	Value	Scoring – part 3				Score		
		0	1	2	3			
ICU beds		>1	1	0	<0			
Total complex medically fit		<30	30-39	40-49	50+			
Band 5 ND not filled		0	1	2	3+			
SUBTOTAL							/9	
GRAND TOTAL							/49	

Score	0-9	10-19	20-29	30-39	40-49
Level	LOW	MODERATE	HIGH	SEVERE	EXTREME

Abbreviations: ED=emergency department; DTA=decision to admit; ICU=intensive care unit; ND=night duty nursing shifts

a HEWS alert, although the site coordinator can be contacted at any time to discuss the most appropriate response.

### Hospital early warning score data from 2018

Figure 2 shows the Antrim Area HEWS categories for the scores recorded in Antrim Area Hospital between 1 January and 31 December 2018. The highest scores were recorded in the early part of the year, with 60% of extreme scores occurring during January. Severe or extreme categories applied for 73% of the time in January, compared with only 6% in May. Table 2 shows that 45% of scores across the year were in low or moderate categories, and that the hospital spent only 3% of its time in extreme escalation. This analysis provides assurance that the Antrim Area HEWS scores reflect real pressures on the site, which are increasingly extreme over the winter period, and that it is appropriately calibrated and indicates extreme status only in the most pressured circumstances.

### Staff feedback

An online staff survey in March 2019 explored awareness and experiences of the Antrim Area HEWS among senior medical, nursing, allied health professional and managerial staff. A total of 232 survey invitations were sent out and 53 responses were received, yielding a response rate of 23%, although not all respondents answered every question. The survey responses identified that:

- » 73% ( $n=37/51$ ) were extremely familiar or very familiar with the Antrim Area HEWS.
- » 56% ( $n=28/50$ ) said the Antrim Area HEWS affected their daily work.
- » 70% ( $n=37/53$ ) considered the Antrim Area HEWS easy or very easy to understand.
- » 84% ( $n=27/32$ ) always or usually carried out their allocated actions when an Antrim Area HEWS alert was received.
- » All four of the ward sisters who responded to the survey considered the Antrim Area HEWS easy or very easy to understand. The average rating of the tool's usefulness in this staff group was 7/10.

Additional comments received in the survey responses included:

- » 'More likely to provide home intravenous or oral antibiotic options to facilitate discharge' (medical consultant).
- » 'Provides me with a valuable indicator of the hospital pressures' (community services manager).
- » 'Prompts review by medics to assess suitability of other patients for discharge' (ward sister).

» *‘Very mindful of when site is under pressure – more likely to visit ED, wards, and so on’* (director on call).

### Benefits of the hospital early warning score

The Antrim Area HEWS was introduced in October 2017. After the first full year of use, several benefits have been identified by the site coordination team:

- » It is an escalation tool that is easy to use, quick to complete and provides an objective method of assessing the pressure on the Antrim Area Hospital site. The information used to calculate Antrim Area HEWS scores was already being captured as part of the site coordination model, and the paper version of the Antrim Area HEWS matrix (Figure 1) has now been replaced with an Excel-based tool that instantly calculates Antrim Area HEWS scores.
- » It provides a set terminology to discuss escalation across the Northern Health and Social Care Trust, from EDs to community-based services, which can be communicated easily and quickly across the system.
- » It is a rapid means of sharing information about hospital status, so that ward sisters and nursing teams can quickly assess levels of pressure across the site.
- » It provides an escalation status that is calibrated for the Antrim Area Hospital site, distinguishing between normal and abnormal levels of pressure. This avoids escalation fatigue by ensuring that extreme escalation is only used in the most challenging circumstances.
- » It includes a new set of actions to respond to high levels of pressure. These actions are targeted and apply not only to the hospital, but also apply to community-based services, which are often important in reducing pressure on an acute site.
- » Other hospital sites in Northern Ireland have begun to develop their own versions of the HEWS tool, which will enable it to be used as a basis for managing regional escalation across acute hospital sites.

### Learning from the implementation process

Designing and implementing the Antrim Area HEWS was a learning experience for all those involved in this process. Some of the learning gained from the implementation process included:

- » Patience. Every hospital site is different and ensuring that scoring is accurate is likely to take time. Data analysis is of value

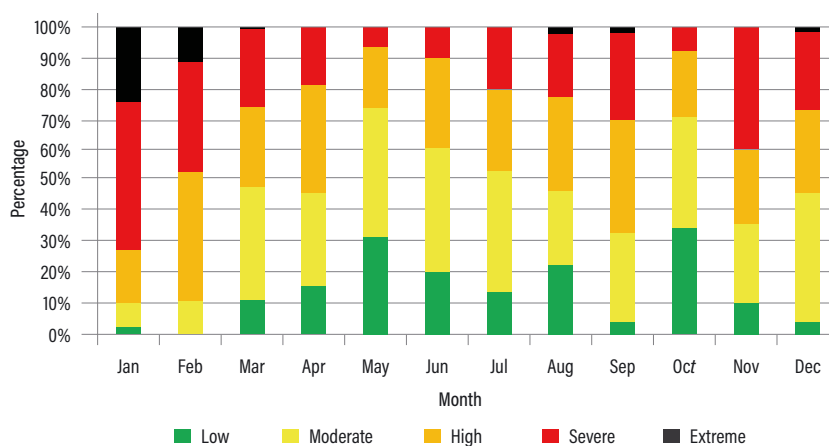
in ensuring this accuracy, but the most useful guides for accurate scoring were the experience of the site coordination team.

- » Simplicity. There were many opportunities to increase the sophistication of the Antrim Area HEWS, for example by using different scoring thresholds at different times of the day. The authors opted to prioritise simplicity of design and use, and found the result met their needs.
- » Communication. Once an effective escalation tool has been developed, it is important to communicate its benefits to other service areas. The authors have found the concept to be intuitive and compelling, particularly to medical and nursing staff who are familiar with clinical scoring tools in a similar format.
- » Engagement. One valuable exercise undertaken when developing the Antrim Area HEWS was asking service areas to consider what they could do to relieve pressure on the hospital. This enhanced their awareness that the pressure that occurs in EDs is a system issue and requires a system-wide response. One part of the system, for example a nursing team on a ward, may often feel detached from the rest of the hospital, and the Antrim Areas HEWS has assisted in developing communication and understanding across the site, particularly at times of severe pressure.

### Conclusion

The development of the Antrim Area HEWS has been a significant step forward in the trust’s management of site-level pressure. It has provided the Northern Health and Social Care Trust with a quick, objective method of assessing pressure on the site, and has raised awareness of hospital pressures

Figure 2. Hospital early warning score by category by month (January–December 2018)





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and increased support for escalation actions from service areas throughout the hospital and beyond. It has also enabled the trust to develop focused, meaningful escalation actions and to trigger these only when appropriate.

Other trusts in Northern Ireland have begun developing their own HEWS tools, and this may provide a basis for managing regional escalation. One challenge experienced by many acute sites is how to respond to periods of increased pressure effectively, and the authors recommend the HEWS as one potential approach to achieving effective escalation.

**Table 2. Percentage of hospital early warning scores by category (January-December 2018)**

Status category	Percentage
Low	15%
Moderate	30%
High	28%
Severe	23%
Extreme	3%

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