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# Ensuring availability of in date and fit for purpose emergency guidelines in all anaesthetic areas throughout the South East Scotland deanery

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## ABSTRACT

Our aim was to institute a system whereby emergency anaesthetic guidelines are available in >90% of appropriate clinical areas throughout each of the acute hospital sites in three health board administrative regions, and whereby >90% of available guidelines are deemed to be in date and fit for purpose. Our objective was to achieve these targets within 6 months.

Using quality improvement methodology, we inventoried available emergency anaesthetic guidelines in 132 locations throughout seven acute care hospitals. Five guidelines were then randomly selected per site per month and assessed for three process markers: was the guideline available in all appropriate areas, was it in-date (i.e. within date of review as specified on guideline or on consultation with author) and was it fit for purpose. Fitness for purpose was assessed by asking a junior colleague to simulate the emergency in a table top exercise using the guideline to aid management. This project was also used as a surveillance system to highlight outdated, unfit or missing guidance. Interventions included iterative revision of the master guideline lists, removal of outdated or unfit guidelines and creation or updating of guideline folders.

30 guidelines were assessed pre-intervention and 203 post-intervention. 52% of guidelines were available in appropriate areas pre-intervention rising to 76% post intervention, 67% of guidelines were in date pre-intervention rising to 82% post-intervention and 87% of guidelines were deemed fit for purpose pre-intervention rising to 92% post-intervention.

We have demonstrated that regular review of emergency guidelines to maintain their currency is achievable and also demonstrated the feasibility of recruiting over 20 trainees across a training deanery to complete a QI project. We believe that organisations should maximise the resource of highly motivated trainees to achieve their QI goals.

## PROBLEM

The South East Scotland School of Anaesthesia encompasses seven acute hospital sites within three health board administrative regions and anaesthesia or sedation is

delivered at numerous sites within each hospital.

It was highlighted at one of these sites that the emergency anaesthetic guidelines required updating following an anaesthetic emergency where the appropriate guideline was found to be out of date and not fit for purpose (it signalled an incorrect location for the emergency drug treatment). Following critical incident analysis it was identified that we lacked a rigorous system to ensure maintenance of the emergency guidelines which are immediately available in anaesthetic areas and that this problem affected all anaesthetic sites within the training deanery.

## BACKGROUND

The Oxford English dictionary defines an emergency as 'A serious, unexpected, and often dangerous situation requiring immediate action'. In the context of anaesthesia, there are several situations which conform to this definition, such as local anaesthetic toxicity or malignant hyperthermia. Several guidelines for the management of anaesthetic emergencies have been published at a national level by such agencies as the Association of Anaesthetists of Great Britain and Ireland (AAGBI),<sup>1</sup> the Difficult Airway Society (DAS),<sup>2</sup> the Obstetric Anaesthetists' Association (OAA)<sup>3</sup> and the Association of Paediatric Anaesthetists of Great Britain and Ireland (APAGBI).<sup>4</sup> The Royal College of Anaesthetists (RCOA) recommends that up to date guidelines for the management of anaesthetic emergencies should be immediately available in sites where anaesthesia or sedation is provided<sup>5-7</sup> to improve clinical team performance when faced with such an event.

There is no universal agreement as to which guidelines should be immediately accessible to clinicians – this is dependant



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upon the clinical scope of the anaesthetic area in question. The RCoA recommends that it is appropriate to have emergency guidelines immediately available where a problem is life threatening or unusual. Several hospitals have created their own sets of recommendations or adapted national guidelines to suit their needs.

This quality improvement (QI) project was subsequently designed with the primary aim of instituting a system whereby the emergency anaesthetic guidelines would be kept in date and fit for purpose and would be available in all of the appropriate areas throughout each of the acute hospital sites in three health board administrative regions: NHS Lothian, NHS Borders and NHS Fife. Our objective was to achieve >90% compliance with each of these standards in 6 months.

## BASELINE MEASUREMENT

Baseline measurements were undertaken in April 2015. A pragmatic decision was made to combine data collection at the two hospitals in NHS Fife (Victoria Hospital Kirkcaldy (VHK) and Queen Margaret's Hospital, Dunfermline (QMH)) for the duration of the project due to availability of data collectors. Five guidelines were randomly selected at each of the six sites. Each of the anaesthetic areas at those hospitals was then assessed to identify whether the five guidelines were available in all appropriate sites, whether the available guideline was in-date and whether it was fit for purpose. Of the 30 guidelines assessed, 52% of guidelines were available in all appropriate areas, 67% were found to be in date and 87% were deemed fit for purpose.

## DESIGN

The demographics of the seven hospitals involved in the project are outlined in Table 1. The total population served by these hospitals is 1,339,380.<sup>8</sup>

Anaesthesia or sedation is delivered at numerous sites within each hospital. These include but are not limited to: anaesthetic rooms in theatres, labour suite, intensive care unit, accident and emergency (A+E) resuscitation room, A+E procedural sedation room, endoscopy suite, cardiac catheterisation laboratory and electro-convulsive therapy (ECT) suite. The total number of areas where anaesthesia or sedation is delivered throughout the three health boards is 132 (Table 2).

SQuARes Net is a trainee-led anaesthetic and critical care quality improvement and research network linking the 7 acute hospital sites within the South East Scotland School of Anaesthesia. The regional project lead was appointed by the network and subsequently anaesthetic trainees were invited to be local leads for each hospital site. Leadership at this level was fluid allowing for frequent rotation of trainees within the training programme. The local leads recruited data collectors from the anaesthetic trainee or medical student pool. In total the project involved 23 anaesthetic trainees, two medical students and one consultant.

Table 1: Hospital Demographics (2015)(9)

| Hospital                                    | Population Group             | Number of beds |
|---|------------------------------|----------------|
| Royal Infirmary of Edinburgh                | Adult, obstetric             | 963            |
| Western General Hospital, Edinburgh         | Adult                        | 711            |
| Royal Hospital for Sick Children, Edinburgh | Paediatric                   | 101            |
| St. John's Hospital, Livingston             | Adult, obstetric, paediatric | 451            |
| Borders Hospital, Melrose                   | Adult, obstetric, paediatric | 276            |
| Queen Margaret's Hospital, Dunfermline      | Adult, paediatric            | 190            |
| Victoria Hospital, Kirkcaldy                | Adult, obstetric, paediatric | 638            |

The project was designed utilising the model for improvement as a planning framework. Two initial planning meetings were held to devise the project strategy and subsequent communication occurred through the regional lead. Data were collected on an online audit tool which is available through the NHS Scotland secure server.<sup>10</sup> No patient data were collected for this project.

Stakeholders were engaged either directly or via the Quality Improvement Team for each region and included theatre managers, clinical directors, operating department practitioners and anaesthetic consultants and trainees.

## STRATEGY

Four interventions were introduced and iteratively revised through multiple Plan-Do-Study-Act (PDSA) cycles within the model for improvement.

### PDSA Cycle 1

The aim for this cycle was to clarify the contents of the currently available guideline folders. All emergency anaesthetic guidelines currently available in areas where anaesthesia or sedation is delivered were inventoried producing a master guideline list for each hospital. Additionally, relevant databases were searched and local experts approached to ascertain a list of currently available local, national and international guidelines which might be considered for inclusion in guideline folders. Our hypothesis for this test was that guideline folders are poorly maintained and were therefore unlikely to include all recently published guidelines. We identified that several recently published guidelines were not available in all of the guideline folders. We did not expect this cycle to impact upon the process measures.

### PDSA Cycle 2

For the second cycle the aim was to update the guideline lists to meet the specific needs of each clinical area. The change hypothesis was that some of the guidelines contained within the folders may no longer be clinically relevant - in particular those locally produced guidelines which had remained unaltered for a significant period

Table 2: Locations where anaesthesia and sedation are undertaken

|               |  | RIE       | WGH       | RHSC     | SJH       | BGH       | QMH      | VHK       | Total      |
|---------------|--|-----------|-----------|----------|-----------|-----------|----------|-----------|------------|
| Theatres      | Anaesthetic rooms                            | 24        | 11        | 5        | 8         | 6         | 5        | 11        | 70         |
|               | Post-anaesthetic areas                       | 3         | 4         | 1        | 1         | 2         | 1        | 2         | 14         |
| Obstetrics    | Labour suite                                 | 1         | 0         | 0        | 1         | 1         | 0        | 1         | 4          |
|               | Anaesthetic room separate from main theatres | 0         | 0         | 0        | 1         | 0         | 0        | 0         | 1          |
| Critical care | ITUs   | 2         | 1         | 1        | 1         | 1         | 0        | 1         | 7          |
|               | HDUs   | 2         | 2         | 0        | 0         | 0         | 0        | 2         | 6          |
| A+E           | Resuscitation rooms                          | 4         | 1         | 1        | 1         | 2         | 0        | 1         | 10         |
|               | Procedural sedation room                     | 1         | 0         | 0        | 0         | 0         | 0        | 0         | 1          |
| Endoscopy     | Endoscopy suites                             | 1         | 5         | 0        | 1         | 1         | 0        | 0         | 8          |
| Cardiac       | Catheterisation laboratories                 | 1         | 0         | 0        | 0         | 0         | 0        | 0         | 1          |
| Others        | Other sites                                  | 4         | 2         | 1        | 1         | 0         | 1        | 1         | 10         |
|               | <b>Total</b>                                 | <b>43</b> | <b>26</b> | <b>9</b> | <b>15</b> | <b>13</b> | <b>7</b> | <b>19</b> | <b>132</b> |

RIE: Royal Infirmary of Edinburgh, WGH: Western General Hospital, Edinburgh, RHSC: Royal Hospital for Sick Children, Edinburgh, SJH: St. John's Hospital, Livingston, BGH: Borders General Hospital, Melrose, QMH: Queen Margaret's Hospital, Dunfermline, VHK: Victoria Hospital, Kirkcaldy, A+E: Accident and Emergency, ITU: Intensive Therapy Unit, HDU: High Dependency Unit, Others include: Electroconvulsive therapy suites, dental theatres, magnetic resonance imaging, neurosurgical catheterisation laboratories, ophthalmology theatres, fertility theatres.

of time. The master guideline list for each hospital was revised in consultation with the clinical directorate to remove outdated guidelines and include newly identified guidelines, creating bespoke lists for each site detailing which guidelines should be immediately available and in which areas. The list was cyclically modified and retested following presentation to anaesthetic departments and discussion with clinical staff. Again we did not expect to see any impact upon the process markers as a result of this PDSA cycle.

### PDSA Cycle 3

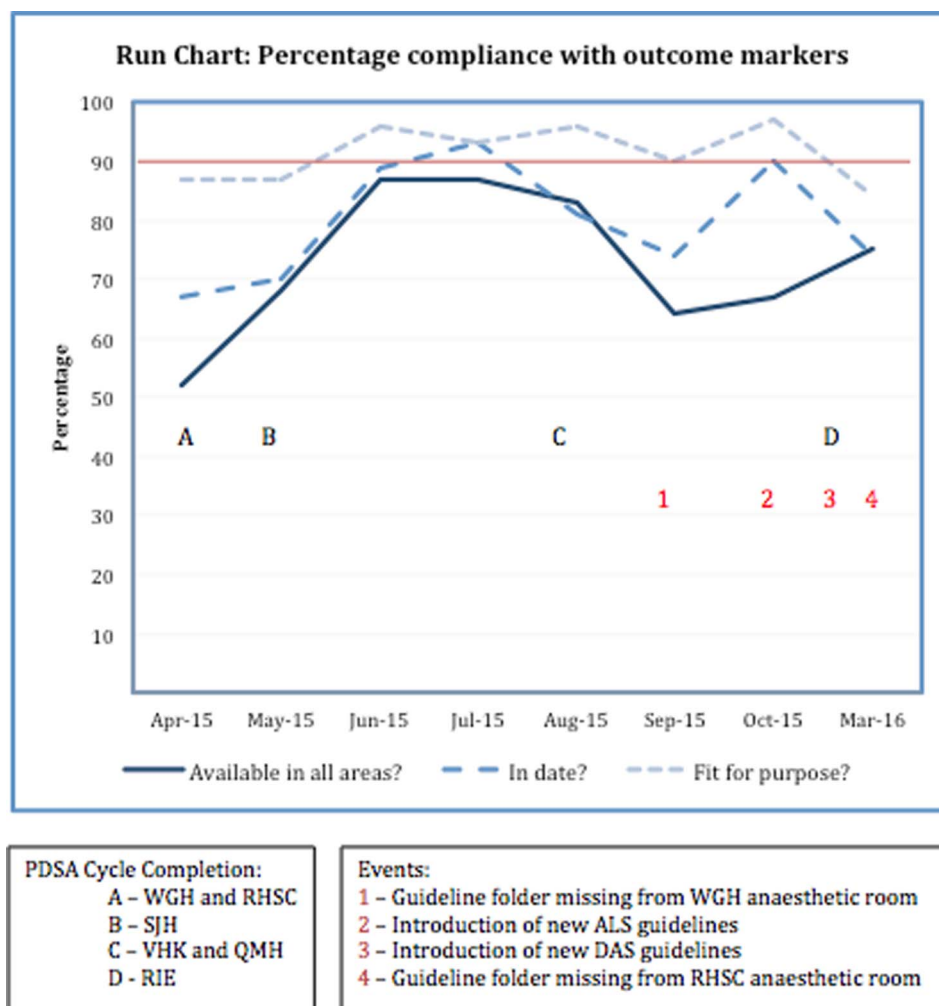
The aim of cycle 3 was to remove outdated or unfit guidelines. At each sampling time point any guidelines which were found to be out of date or unfit for purpose were updated or removed from clinical areas if a suitable replacement could not be found. Where it was felt that a completely new local guideline was required this was

referred to the clinical directorate. The creation of new guidelines was outwith the scope of this project. We hypothesised that this intervention would result in a trend towards improvement in the in date and fit for purpose process markers and this effect was indeed observed.

### PDSA Cycle 4

The aim of this cycle was to create in date and fit for purpose guideline folders for all areas. Based upon the results of the first three cycles, new emergency anaesthetic folders were created or updated and placed in anaesthetic areas. We hypothesised that this would result in a trend towards improvement in all three process markers and this trend was observed.

The interventions were introduced in an independent manner by teams at each site and the timescales for completion therefore varied.



For each cycle of data collection, five guidelines were randomly selected from the master guideline list per hospital using an online research randomizer<sup>11</sup>. These guidelines were subsequently assessed for compliance with three process measures:

1. Is the guideline available in all appropriate areas?
2. Is the guideline in date?
3. Is the guideline fit for purpose?

Data for all sites were collated by the regional coordinator leading to a possible total of 30 data points per data collection cycle.

The process measures were not inter-dependent for compliance, i.e. a guideline could be marked as compliant for measure 1 but non-compliant for measures 2 and 3 and likewise a guideline could be non-compliant for measure 1 but compliant for measures 2 and 3 - in the event of a missing guideline folder for example. If all copies of the guideline were absent then process measures 2 and 3 could not be assessed and were therefore marked as non-compliant.

For the 'fitness for purpose' assessment, a junior anaesthetic colleague (CT1 or 2 or ACCS) or medical student simulated managing the emergency using the guideline as an aid. During the course of the simulation, this colleague would be asked to locate the required

drugs, equipment and/or staff in real time to ensure that they were available, in date and located where specified in the guideline.

Guidelines were determined to be in date either through confirmation from the original publishers or by identifying the 'review by' date. Any local guidelines which did not have a 'review by' date or named author were referred back to the clinical directorate for consideration of review.

Percentage compliance with the process measures was recorded on a run chart. Run chart analysis was performed to identify non-random variation using the baseline as a comparator.

## RESULTS

Overall data return was 97.1%. The project continued for 1 year by which time the PDSA cycles had been completed in 6 out of 7 hospitals. Data collection cycles were intermittent and timed to coincide with availability of network members. Each data collection cycle was completed within one month from randomisation. By the end of October 2015 the PDSA cycles had been completed in 5 out of 7 hospitals but progress had stalled at the other 2 sites. For this reason data collection paused

to focus efforts at these sites on project completion. One site (BGH) opted to withdraw from the project in February 2016 due to lack of network member availability.

Baseline measurements were undertaken in April 2015, followed by implementation of the PDSA cycles. These were not uniform in timing but the majority of the sites had completed the cycles within the first 6 months (see run chart). 30 guidelines were assessed pre-intervention and 203 post-intervention. 52% of guidelines were available in appropriate areas pre-intervention rising to 76% post intervention, 67% of guidelines were found to be in-date pre-intervention rising to 82% post-intervention and 87% of guidelines were found to be fit for purpose pre-intervention rising to 92% post-intervention.

All of the sites managed to achieve 100% compliance with all 3 markers at some point following implementation of the PDSA cycles - one hospital had 100% compliance with all 3 markers in the first month following implementation, two hospitals had full compliance in the second month and 3 hospitals had full compliance in the third month. Unfortunately full compliance was not universally sustained - four sites retained 100% compliance with all three process markers for at least two out of three of the last three data collection cycles but the other two did not. One site which failed to sustain full compliance was RIE - the largest site within the project and therefore the most susceptible to confounding of the data caused by missing or incomplete guideline folders. The other site was BGH - the most remote site and the most poorly staffed by network members.

## LESSONS AND LIMITATIONS

Our multi-centre quality improvement project aimed to improve the quality of emergency anaesthesia guidelines in 132 locations in seven acute hospital sites. Through a process of assessing and revising master guideline lists and updating guideline folders, we demonstrated a positive trend in three process markers - availability in anaesthetic areas, fitness for purpose and in-date guidance.

The outcomes of this QI initiative are of importance as they demonstrate the successful application of what we believe to be a novel method for maintaining currency of paper guidelines. Vitally, the assessment method involved in this initiative doubles as a surveillance system, acting to trigger update of guidelines or replacement of missing guidelines. Published reports relating to this area tend either to describe guideline creation to improve management of anaesthetic emergencies,<sup>12</sup> or audit of availability of emergency guidelines and emergency equipment.<sup>13–16</sup> However, there is a paucity of published literature relating to QI initiatives to maintain the currency of such guidance. Perhaps in the future paper guidelines will become obsolete altogether - indeed a recently published QI initiative describes the creation of a smartphone application

containing hospital guidance which successfully led to an improvement in availability of emergency guidelines.<sup>17</sup>

This project had a number of strengths. The network system allowed a 'rotating platform' of trainees who could remain involved in the project whilst they moved through different hospital sites as part of their training. This has transpired to be a highly effective method of involving trainees in quality improvement and allowing simultaneous multi-site quality improvement. The guideline surveillance method has been demonstrated to be simple and effective in maintaining the currency of paper guidelines and as a result has been instituted at each individual site.

The limitations of this study are as follows: a paucity of network members at distant sites led to delays in completion of the interventions. At one hospital we were unable to complete the PDSA cycles within 1 year although data collection was unaffected. Work is continuing at that site to institute new guideline folders and the paper guideline surveillance system. Also, interventions were introduced after a single baseline measurement due to the urgency with which they were required. Analysis was limited by the varied timing of introduction of PDSA cycles at the different hospitals. It is, therefore, not possible to state with statistical certainty that the improvement demonstrated is as a direct result of the interventions, but feedback from the departments involved has led us to believe that this is indeed the case.

The project was designed to be self-sustaining at remote sites and therefore a pragmatic sample size was selected. Relative to the total number of guidelines in circulation, the sample sizes were small and this could potentially have led to selection bias. The process markers were 'all-or-nothing' in the sense that in a hospital such as RIE with 43 anaesthetic areas, if one folder was absent, all 5 guidelines being assessed would fail for the availability marker. This may have had a confounding influence on the data and led to our failure to achieve >90% of guidelines being available in all anaesthetic areas.

## CONCLUSION

We believe that this QI methodology could be usefully employed in several areas where paper guidelines are still considered necessary. In addition we have demonstrated the feasibility of recruiting over 20 trainees across a training deanery to complete a QI project. We believe that organisations should maximise the resource of highly motivated trainees to achieve their QI goals.

This platform has been designed to be sustainable by the departments involved. In the future the random sampling guideline checks will occur with less frequency but for patient safety it is vital that the guidelines are maintained. To assist other departments in preparing and maintaining their guideline folders it would be

useful if governing bodies could issue recommendations on which guidelines should be immediately available in anaesthetic areas.

In conclusion, this QI project helped improve the quality of emergency guidelines available in anaesthetic sites in our region. We have demonstrated that regular reviewing of emergency guidelines to maintain their currency is achievable and as a result has been instituted at each individual site.

**Collaborators** The following authors are collaborators and part of SQUARES net; Regional Lead and Primary Author; Elise Hindle Manuscript Preparation; Nazir Lone, David Falzon, Patrick Cowie, Simon Chillingworth, Data Collection, Catherine Collinson Sarah Stobbs, Eleanor Little, David P Hall, Alice Harpur, Catherine Stretton, Anna Quinn, Vanessa MacKenzie, Sarah Fadden Emma Coley, Matthew Wilkes, Helen Surgenor Alexandra Nelson, Gerard Manning, Rachel Harvey Joanna Renee, Judith Dickson, Victoria McMullan Stephen Alcorn, Katriona Montgomery, Emma McLaughlin.

**Declaration of interests** The authors have no competing interests to declare.

**Ethical approval** The proposed project protocol was reviewed by NHS Lothian Research and Development. The project was deemed to be audit and therefore full ethics committee approval was not considered necessary.

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