

Rapid access ultrasonography: A novel service facilitating a reduction in time to clinical decisions for patients with acute abdominal pain

Sandeep Singh^a, Syed Hussain Abbas^{a*}, Muhammad Osman Karima^b, Khalid Akbari^b, Spyros Marinos Kourisa^b, Jeffrey Gilmour^a

Abstract

Introduction: The Emergency General Surgery (EGS) Commissioning Guide, 2014 has recommended development of pathways for the management of acute abdominal pain. This study aims to evaluate the impact of two different pathways (i) ward-based ultrasonography and (ii) a rapid access to ultrasonography service on the admission pathway for EGS patients at a tertiary teaching hospital.

Methods: A prospective comparison was made between trials of a new ward-based ultrasonography service (n=54) and a rapid access to ultrasonography service (n=66) compared to the existing radiology department based service (n=65). Data for each group was collected over three different five day – weekday periods between November 2014 and June 2016. All EGS patients requiring an ultrasound scan for right upper quadrant or right iliac fossa pain as a first line investigation

Keywords: Acute abdominal pain; ultrasonography; outcomes.

Authors' Addresses: ^aDepartment of Emergency General Surgery, Oxford University Hospitals NHS Foundation Trust, John Radcliffe Hospital, Headley Way, Oxford OX3 9DU, United Kingdom.

^bDepartment of Emergency General Surgery, Buckinghamshire Healthcare NHS Foundation, Stoke Mandeville Hospital, Mandeville Road, Aylesbury HP21 8AL, United Kingdom.

Corresponding author: Syed Abbas, Department of Emergency General Surgery, Oxford University Hospitals NHS Foundation Trust, John Radcliffe Hospital, Headley Way, Oxford OX3 9DU, United Kingdom. E-mail: dr.abbas@doctors.org.uk

were included in the study. The following parameters were assessed: (i) time of ultrasound booking to report and (ii) subsequent clinical decision or outcome. Statistical analysis was performed using the independent sample t-test.

Results: Rapid access to ultrasonography showed the greatest reduction in times compared to the existing radiology department based service. The mean time of ultrasound request to report was reduced by 385 minutes (p = 0.006) and the mean time of ultrasound report to clinical decision was reduced by 550 minutes (p = 0.001).

Conclusion: Rapid access to ultrasonography facilitated reduction in time from booking to reporting of scans and consequently advanced clinical decision-making. It has potential cost benefits, enhances the admission pathway and prevents delays to diagnosis and management.

Introduction

The Emergency General Surgery (EGS) Commissioning Guide, 2014 has emphasized the importance of developing surgical pathways for management of acute abdominal pain as it is a frequently encountered presentation in EGS and holds a large inpatient load of varied diagnosis. Additionally, the care and funding for this group of patients have been historically overlooked resulting in inconsistency in their management [1].

Acute presentations including right iliac fossa pain, biliary colic and acute cholecystitis pose significant costs and may account for a large percentage of inpatient admissions. However, development of ambulatory care pathways and acute surgical assessment units may decrease rates of admission within this group of patients by up to 30% and therefore reduce costs [1]. The use of such pathways to ensure rapid access to imaging must be developed and even assigned by means of convention with hospital management [1].

In particular, abdominal ultrasound is regarded as invaluable imaging modality for assessment of the acute abdomen especially with regards to biliary, gynecological and renal pathology [2, 3]. In this study we aim to evaluate the impact of two novel pathways including ward-based ultrasonography and rapid access to ultrasonography services on the EGS admission pathway.

Methods

A prospective comparison was made between trials of a new ward-based ultrasonography service (n=54) and a rapid access to ultrasonography service (n=66) compared to the existing radiology department based service (n=65). During the trial of the new ward-based service all ultrasound scans requested for EGS patients were performed on the emergency surgical unit ward by a radiographer who was available to perform an unlimited number of scans between 0800-1200 hours. Following the success of the ward-based service, a further trial of rapid access to ultrasonography service was established by convention between the EGS team, hospital and radiology department management. This service was located in the radiology department and the majority of patients were able to walk directly to the department rather than wait for porters to transport them. Additionally, these ultrasound scans were performed 'on demand' rather than having fixed designated slots. This therefore conferred more flexibility for EGS patients as ultrasound scans requested 'on demand' were spaced between the existing list and prioritised on clinical urgency. As a result, there was potential to perform an unlimited number of scans being between 0800-1700 hours. Prior to the interventions, the existing radiology department based service constituted of three designated slots for surgical patients between 0800-1200 hours and all scans performed after this were subject to availability by the radiology department.

Data for each group was collected over three different five day weekday periods between November 2014 and June 2016 by the

on-call core surgical trainee or senior clinical fellow. Data for the control group of the existing radiology department service and trial of ward-based ultrasonography group was collected between November 2014 and April 2015. Data for the trial of the rapid access to ultrasonography group was collected between April 2016 and June 2016.

All EGS patients suitable for an ultrasound scan for right upper quadrant or right iliac fossa pain as a first line investigation rather than other indicative imaging such as computed tomography (CT) or MRCP were included in the study. The following parameters were assessed: (i) time of ultrasound booking to report and (ii) subsequent clinical decision or outcome. Statistical analysis was performed using GraphPad Prism version 6.0 software and the independent sample t-test was applied. A p-value <0.05 was considered statistically significant. The study was registered as an audit with the necessary institutional approval covering ethics. Preparation of the manuscript was in accordance with the Standards for Quality Improvement Reporting Excellence (SQUIRE 2.0) guidelines [4].

Results

The control group (existing radiology department based scans) consisted of 65 patients. The mean booking to report time for abdominal ultrasound was 712 minutes and median was 341 minutes (range 5-5351 minutes). The mean report to outcome time was 687 minutes and median was 191 minutes (range 0-7664 minutes) (Table 1).

The first trial group (ward-based scans) consisted of 54 consecutive patients. The mean booking to report time for abdominal ultrasound was 433 minutes and median was 171 minutes (range 2-1782 minutes). The mean report to outcome time was 606 minutes and median was 170 minutes (range 0-4515 minutes). The mean booking to report time was reduced by 279 minutes compared to the control group (p = 0.075). The mean ultrasound report to outcome time was reduced by 81 minutes compared to the control group (p = 0.699) (Tables 1 and 2).

The second trial group (rapid access to ultrasonography based scans) consisted of 66 patients. The mean booking to report time for abdominal ultrasound was 327 minutes and median was 170 minutes (range 6-1276 minutes). The mean report to outcome time was 137 minutes and median was 69.5 minutes (range 1-1345 minutes). The

mean booking to report time was reduced by 385 minutes compared to the control group (p = 0.006). The mean ultrasound report to outcome time was reduced by 550 minutes compared to the control group (p = 0.001) (Table 2).

Discussion

The Emergency General Surgery Commissioning Guide 2014 has advocated the development of care pathways to improve the quality of care of surgical patients. However, there have been no previous studies assessing the efficacy of the impact of ward-based and rapid access to ultrasonography on the EGS pathway although currently some surgical units have been granted daily radiology department based ultrasonography slots for acute surgical admissions [1]. Nonetheless, these slots may be limited and access to these may be difficult depending on the time of booking, availability of ultrasonographers and porters as well as the location of the radiology department. With introduction of ward-based and rapid access to ultrasonography services we addressed such limitations. We have demonstrated that the care pathway at our institution for EGS patients was enhanced as the mean time of ultrasound request to report and clinical decision was consistently reduced with implementation of each service. However, rapid access to ultrasonography showed greatest reduction in times compared to the ward-based ultrasonography and existing radiology department based service. The mean time of ultrasound request to report was significantly reduced by 106 minutes compared to the ward-based ultrasonography group and by a total of 385 minutes compared to the existing service (p = 0.006). Additionally, the mean time of ultrasound report to clinical decision was also significantly reduced by 469 minutes compared to the ward-based ultrasonography group and by 550 minutes compared to the existing service (p = 0.001). No patient in the rapid access to ultrasonography group waited greater than 24 hours for either ultrasound report or clinical decision compared to 90 hours and 128 hours respectively in the control group of the existing service.

During the trial of the ward-based service, patients were asked to directly walk to the ultrasound investigation room located within the emergency surgical unit ward. Following the success of the ward-based service a further rapid access to ultrasonography service was established and whereby patients were able to walk directly to the radiology department for an 'on demand' ultrasound scan. These scans were spaced between existing slots on the radiographers list

Table 1 Ultrasound request to reporting (minutes).

	Existing service (N=65)	Ward-based ultrasound (N=54)	Rapid access ultrasound (N=66)
Mean	712	433	327
Median	341	171	170
Range	5-5351	2-1782	6-1276
p value	-	0.075	0.006

Table 2 Ultrasound request to reporting (minutes).

	Existing service (N=65)	Ward-based ultrasound (N=54)	Rapid access ultrasound (N=66)
Mean	687	606	137
Median	191	170	69.5
Range	0-7664	0-4515	1-1345
p value	-	0.699	0.0005

and were prioritised on clinical urgency. Therefore, no additional resources were incurred and successful implementation of the service required radiographers to be flexible and accommodating for EGS patients. Both new services therefore helped reduce portering times. Patients unable to walk to have a scan were personally transferred by surgical staff compared to the control group (existing service) where patient transport to the radiology department was dependent on the availability of porters. This therefore incurred additional costs and may have influenced delay in time from ultrasound request to report and subsequent clinical decision. Overall, although initially these services were introduced on a trial basis, each service showed consistent improvement in outcomes. The rapid access to ultrasonography service showed the most significant improvement and was found to be a practical and sustainable service. Through continued collaboration with the radiology department this has shown long-term quality improvement. Therefore, since the second phase of the study i.e. rapid access to ultrasonography we have not returned to the previous service.

Further improvement to our service may be achieved by the following: (i) Availability of a permanently designated ultrasound room for the EGS patients and availability of ultrasonography for a full 7-day period rather than a 5-day week-day period (ii) A dedicated ultrasound machine and ultrasonographer to provide this service between 0800-1700 hours and (iii) Training of surgeons to perform abdominal ultrasounds which will be particularly useful in the out-of-hours setting. Additionally, report to outcome or clinical decision times can be improved by ensuring that the ordering clinician is contacted by the radiographer immediately after the scan results are made available in order to ensure urgent senior review (MRCS qualification or above) for making clinical decisions and aiding management outcome.

Conclusion

The rapid access to ultrasonography service reduced the time from booking to reporting of scans and consequently advanced clinical decision making and outcomes compared to the ward-based ultrasonography and existing radiology department based service. It has potential cost benefits, enhances the patient admission pathway, prevents delays to diagnosis and management. The service incurred no additional resources or costs and has shown long-term sustainable quality improvement for EGS patients.

Conflict of interest

The authors declare that they have no conflict of interest.

Funding

None.

References

1. The Royal College of Surgeons of England. **Commissioning Guide: Emergency General Surgery**. London: RCSE, 2014.
2. Walsh PF, Crawford D, Crossling FT et al. The value of immediate ultrasound in acute abdominal conditions: a critical appraisal. **Clinical Radiology** 1990;**42**:47–49.
3. Nural MS, Ceyhan M, Baydin A et al. The role of ultrasonography in the diagnosis and management of non-traumatic acute abdominal pain. **Internal and Emergency Medicine** 2008;**3**:349–54.
4. Ogrinc G, Davies L, Goodman D, et al. SQUIRE 2.0 (Standards for Quality Improvement Reporting Excellence): revised publication guidelines from a detailed consensus process. **BMJ Quality and Safety** 2015;doi:10.1136/bmjqs-2015-004411.