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Abdominal ultrasound referred by the Emergency department – Can sonographer findings help guide timely patient management?

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ABSTRACT

Objective: To compare sonographer findings with radiologists' reports regarding the level of agreement, ability to answer the clinical question, and the use of hedging (descriptive words that do not commit to a definitive diagnosis) in abdominal ultrasound cases referred by the Emergency department. Other criteria compared included caveats of image quality and requests for further investigations.
Methods: Abdominal ultrasound examinations referred by the Emergency department at a large regional tertiary hospital were retrospectively reviewed and sonographer findings compared with radiologists' reports. A consultant Intensivist scored all examinations into one of four categories according to the level of diagnostic agreement between the sonographer and associated radiologists. The same rater also identified where hedging terminology was used, whether the clinical question posed was answered and when further requests for investigations (including imaging) were made. The proportion of scores between sonographers and radiologists for each outcome variable were analysed using Fisher Exact tests.
Results: Eighty-six cases were identified for this study. Of those, 73 (84.9%) were in complete agreement. In 12 cases (14.0%) a minor discrepancy was reported and only one case (1.1%) was scored as moderately discrepant between sonographers findings and radiologists' reports. There were no significant differences in the use of hedging, ability to answer the clinical question, requests for further investigations or interpretation of image quality.
Conclusion: Sonographer findings for cases of abdominal ultrasound referred by the Emergency department have a high level of agreement with radiologists' reports and could form the basis for acute patient care when radiologists' reports are unavailable.

Introduction

Sonographers in Australia perform diagnostic medical ultrasound examinations which result in recorded images and written sonographer findings. These images and findings are used by radiologists to provide the diagnostic outcome of an ultrasound examination in the form of a written report. According to the Australian Sonographers Association's (ASA) work practices survey (2009)[1] and anecdotal evidence from several Queensland (QLD) hospitals, sonographer findings are used by treating medical practitioners for patient management decisions. This is of particular relevance in the Emergency department, where radiologists' reports are not always available in a timely manner. There is, however, little documented evidence about the accuracy of sonographers' reports compared to the final radiologists' report. Several studies have reported that reports by sonographers and experienced radiographers can achieve high levels of accuracy when compared to those by radiologists.[2–9]

Where a radiologist report is unavailable, the provision of accurate, timely and cost-effective sonographer diagnostic findings may improve the quality of emergency care and treatment results for medical practitioners. This is of particular relevance to the management of patients in regional and remote health care facilities where radiologists' reports are more likely to be unavailable or reporting delayed. To date, no research has been published exploring the level of agreement and clinical usefulness of sonographer findings compared to radiologists' reports in Australian hospitals.

It is hypothesised that sonographer findings are in diagnostic agreement with the radiologists report and that sonographers are able to answer the clinical question posed by the referring clinician for patients who were referred from the Emergency department for abdominal ultrasounds. The objectives of this study were to:

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1. Compare the level of diagnostic agreement between sonographers and radiologists.
2. Evaluate whether the clinical question posed by the referring clinician was answered by the sonographer findings.
3. Evaluate differences between the sonographers' and radiologists' reports with regard to ambiguous diagnostic statements, caveats of image quality, and requests for further investigations (including additional medical imaging).

Methods

This study was approved by the Monash University Human Research Ethics committee and the Queensland (QLD) Health Human Research Ethics committee (Approval # CF12/0577 – 2012000040).

Data collection

The data sample containing sonographer findings and associated radiologists' reports were retrospectively identified and retrieved from the Picture Archiving and Communication System (PACS) at a regional Tertiary QLD Health Hospital from September–December 2011. All consecutive abdominal ultrasound examinations referred by the Emergency department within this time period were included for analysis. The Emergency department includes the supporting wards, namely Emergency Short Stay and Emergency Medical Unit. Patients under eighteen years of age at the time of the ultrasound scan, those not reported nor validated by a Royal Australian and New Zealand College of Radiologists (RANZCR) consultant, those not undertaken by an Australian Sonographer Accreditation Registry (ASAR) accredited sonographer, or those documenting that the sonographer had collaborated with the radiology team to create the final report were excluded from analysis.

Scoring criteria

Sonographer findings were scored by an independent consultant Intensivist into one of four categories according to the level of diagnostic agreement between the sonographer findings and associated radiologist's report:

1) *Category 1* – Agree with the radiologist report.
2) *Category 2* – Minor discrepancy unlikely to alter patient management.
3) *Category 3* – Moderate discrepancy likely to alter patient management but not lead to adverse outcomes for the patient.
4) *Category 4* – Major discrepancy, sonographer findings likely to result in a significantly adverse outcome for the patient.

The intensivist who was not affiliated with either the Emergency or Diagnostic Imaging departments was chosen as the rater in this study in order to provide independent and unbiased evaluation of the relevant ultrasound reports.

The sonographer findings and radiologists' reports were also evaluated for the use of hedging vocabulary. Reports were scored into either: 'Yes' a hedge was made: or 'No' a hedge was not made. Hedging vocabulary included, but was not limited to terms such as *suggestive of*, *no definite*, *no gross*, *no obvious*, *no significant*, *suspicious for*, and *clinical correlation needed*. Hedged vocabulary included *appears*, *possible*, *borderline*, *doubtful*, *suspected*, *possible*, *probable*, *suggested*, *vague*, *equivocal* or just prefixing a pathology with a question mark. Hedging vocabulary also included descriptive terms specific to ultrasound such as echogenic, hypoechoic, anechoic, through-transmission, and shadowing without any pathognomonic explanation.

Any statements regarding image quality in the radiologists' or sonographers' findings were scored as either: 'Yes' a caveat of image quality was made: or 'No' a caveat of image quality was not made. A caveat of image quality included statements referring to poor demonstration of anatomy/pathology such as *patient habitus, patient discomfort, poor respiratory control, excess bowel gas, overlying bowel gas, intercostal views*, and terms associated with poor patient preparation such as *under filled bladder*.

Findings and reports were also categorised in regards to whether the clinical question was answered and if recommendations were made for further investigation. Findings and reports were categorised as either: 'Yes' the clinical question was answered; 'No' the clinical question was not answered; or 'Indeterminate' if no question was posed on the request form. Those cases categorised as 'Indeterminate' were excluded from the study. With regard to recommendations for further investigation (including diagnostic imaging), findings and reports were categorised as either: 'Yes' a recommendation for further investigation was made; or 'No' a recommendation for further investigation was not made.

Statistical analysis

Contingency tables (2×2) were used to carry out two-tailed Fisher's exact tests to establish the differences in proportion between sonographer findings and radiologist reports for the variables studied. A p-value of <0.05 was afforded significance. All analyses were carried out using SPSS version 20.0 (Chicago, USA).

Results

One hundred and eighty three abdominal ultrasound cases were identified. Of these, 61 cases (33.3%) were not reported by a radiologist. In 24 cases (13.1%), the final report was based on collaboration between the radiologist and sonographer and a further 12 cases (6.6%) were reported by a radiology registrar. All of these cases were excluded from the study. The remaining 86 cases formed the data set for this study. Of these, 19 cases (21.8%) were reported to be within normal limits by both the sonographer and radiologist. The cases included 31 males and 55 females with a mean age of 47.3 years (range 18–88). Eleven sonographers with experience ranging from six months to 21 years performed and wrote findings for the abdominal ultrasound data set.

Table 1 summarises the level of diagnostic agreement between sonographers and radiologists as scored by the intensivist. The sonographer and radiologist were in complete agreement (Category 1) in 73/86 (84.9%) cases. Twelve of 86 (14.0%) sonographer findings had a minor difference with the radiologist report unlikely to alter patient management (Category 2), and 1/86 (1.1%)

Table 1
Categories of agreement[a] between sonographer findings and radiologists' reports in abdominal ultrasound cases referred by the Emergency department (Total $N = 86$).

Grading score	Frequency
Category 1	73/86 (84.9)
Category 2	12/86 (14.0)
Category 3	1/86 (1.1)
Category 4	0/86 (0.0)

[a] Category 1 = Complete agreement; Category 2 = minor discrepancy; Category 3 = moderate discrepancy without adverse effects on patient management, Category 4 = high discrepancy with adverse effects on patient management.