"Application Of DOPS (Directly Observed Procedural Skills)
In The Pre Call Proficiency Assessment Of FIRST YEAR
RADIOLOGY RESIDENTS In Ultrasound."

Poster No.: C-0964
Congress: ECR 2014
Type: Educational Exhibit
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Keywords: Education and training, Health policy and practice, Ultrasound, Management, eHealth
DOI: 10.1594/ecr2014/C-0964

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Learning objectives

To analyze the impact of directly observed procedural skills (DOPS) for assessment of ultrasound of first year residents in our radiology residency program. This is a newer educational technique that has replaced the conventional end of rotation written feedback used in previous years in our department.

Background

Postgraduate medical education and training is a dynamic field undergoing major changes throughout the world and requires newer educational techniques and assessment tools to cater for the ever changing demands. These techniques and tools must be tailor made for each post graduate specialty and sub specialty.

Radiology differs from other specialties in multiple ways. Trainees work in their early years in a close apprenticeship with their supervisors and are protected. Their knowledge and skills in the workplace, are being assessed but not in a standardized way, and are not formally documented. Diagnostic sonography is perhaps the most difficult subspecialty to prepare first-year radiology residents for overnight call, because they must master both the technical aspects of scanning and the interpretive skills of sonography\textsuperscript{1,2,3}. Sonography represents a major proportion of studies requested by Physicians both during day hours and on call, because of the availability and safety of the modality. Our ultrasound department is very busy, so rapid patient throughput is necessary. Having a novice resident scan a patient before the sonologist adds time to the examination, which stresses our schedule and is sometimes seen by the patient as an unnecessary inconvenience. We felt that clinical time pressures are negatively impacting upon the educational requirements of our residents.

We felt that performance-based methods such as direct observation of procedural skills are ideal in the assessment of diagnostic sonographic procedures. Mock scenarios and patients can help in training and assessment of the core skills of diagnostic radiology and reduce the time required for achieving and maintaining competence. This technique has been applied to different specialties in postgraduate medical education and training and although it has been proposed that it can be applied effectively in radiology as well\textsuperscript{4}, we found no published data to date where DOPS has been practically applied to assess diagnostic ultrasound skills in radiology residents.
Therefore we decided to try applying "direct observation of procedural skills (DOPS) to assess and improve the ultrasound skills of our newly inducted first year residents.

**Directly Observed Procedural Skills (DOPS):**

Direct observation of procedural skills (DOPS), initially developed by Royal College of Physicians in the United Kingdom, requires an assessor to directly observe a trainee undertaking a procedure and then grade the performance of specific predetermined components of the procedure\(^5\). In addition to the procedure itself, these skills also include communication and the informed consent process.

It has been proposed that DOPS can have a role in the formative assessment of radiology residents. It can be used to evaluate residents' performance, provide feedback, and identify areas for improving performance and filling in identified gaps\(^4\). This technique has the ability to assess the four levels of competence described by Miller's pyramid (*Fig.1*). The steps progress from knows, which reflects applied knowledge, through knows how, which requires more than knowledge alone, and shows how, which requires an ability to show clinical competency, to does which is the actual requirement.

**Images for this section:**
Fig. 1

MILLER'S PRISM OF CLINICAL COMPETENCE (aka Miller's Pyramid)

it is only in the "does" triangle that the doctor truly performs

Based on work by Miller GE. The Assessment of Clinical Skills/Competence/Performance; Acad. Med. 1990; 65(9): 63-67
Adapted by Drs. R. Mehay & R. Burns, UK (Jan 2009)
Findings and procedure details

Implementation of new rotation schedule:

Over the past few years radiology practice has evolved rapidly with added pressure on residency programs as well. Anecdotal experiences in the development of our radiology residency training program describe the rise and fall of different techniques of assessment of junior residents' proficiency across different imaging modalities for safe, competent and efficient practice of radiology. What seemed to be lacking was a standardized and objective approach that could be used as a yardstick to gauge individual abilities and to compare different resident batches. Although the need for a new tool was duly recognized by senior faculty and residents alike, the thought of implementing any new tool across the board seemed a formidable task, it was thought best to begin with a single imaging modality. As ultrasonography and radiography form the main bulk of on-call workload, it was decided to start off with sonography.

A special training program was designed by mutual agreement of senior faculty members and sonologists after seeking necessary approval from program director and post graduate medical education committee. Under this training schedule, all our newly inducted first year radiology residents were placed in a pre-planned rotation of two months duration in ultrasound department. During this rotation, every resident was exposed to equally fixed training hours with each sonologist to counter any trainer related bias. The residents were exposed to different sonography machines. Lectures were delivered about the basics of equipment and probe handling and Knobology, as well as the basics of gray scale and Doppler imaging techniques. Departmental ultrasound protocols were handed over to residents at start of rotation. New residents were also instructed to observe sonologists during routine procedures. (Fig. 2)

A list (Table 1) covering both most frequently seen and clinically important emergency and routine gray scale and Doppler procedures and diagnoses was given to the residents during orientation.

Implementation of new assessment tool:

DOPS was implemented as a tool for assessing junior residents' proficiency in performing ultrasound at the end of two months intensive training. The DOPS session comprised of a single station, clinical scenario based, mock exam whereby a senior radiology faculty member with more than three years post specialization training in ultrasound was jointly appointed to serve as moderator and invigilator of exam. A healthy volunteer was
chosen and was instructed to role play as different patients presenting with different clinical complaints during any one session with previously provided answers to possible questions by candidates. Participation of all junior residents was made compulsory. Each candidate was asked to enter the single station one by one and interact with the patient and proceed with performing relevant sonological study relevant to the simulated clinical scenario while the examiner stood by as a silent observer. Fixed time was given to each candidate. Commands were also given to candidates at the end of each procedure for performing any limited part of an exam that may not be directly related to the scenario at the time. After this technical aspect of exam, the examiner asked few questions from each candidate related to theory of basic normal and pathologic imaging findings as well as basic Knobology of machine.

**Outcome measurements:**

**Assessment of candidates:**

On spot assessment of each candidate was made by the examiner with help of pre-designed assessment forms wherein each candidate was assessed in four areas: approach to patient, equipment operation, theoretical knowledge and technique; with special emphasis on technique and procedural skill. *(Fig. 3).*

The performance was graded according to a set scale of four grades (excellent, good, satisfactory and below average) and results were complied. Immediate feedback was also given to each candidate regarding any flaws in technique or approach and demonstration of normal technique was also given if deemed appropriate.

**Qualitative feedback by residents:**

Two separate questionnaires were used to conduct a post-implementation survey among junior residents and senior residents *(Figure 4).* The questionnaires were designed to comment on the performance of the junior residents during during call hours with specific reference to proficiency in ultrasound performance. Feedback was also obtained from senior and junior residents on this new DOPS system and comparison with conventional end of rotation assessment. Resident feedback was also asked regarding their suggestions for implementation of DOPS in other areas or its modification.

**Images for this section:**
Figure 2. Steps followed in resident preparation in initial two months training

**Fig. 2**
**LIST OF DON’T MISS EMERGENCIES GIVEN TO RESIDENTS:**

**CHEST**
- Pleural effusion

**GASTROINTESTINAL**
- Cholelithiasis
- Acute cholecystitis
- Acute pancreatitis
- Appendicitis
- Free fluid / Trauma

**GENITOURINARY**
- Renal or ureteric stone
- Ectopic pregnancy
- Routine obstetrical
- Testicular torsion
- Abortion/Retained product of conceptions

**MISCELLANEOUS**
- To look for collection after surgeries
- Neonatal head scan

**DOPPLER**
- Deep Venous thrombosis

Table 1
Interaction with the patient
Machine handling
Measurements
Theoretical knowledge

Figure 3. Four components of assessment during DOPS session.

Fig. 3
REGARDING RECENTLY CONDUCTED DOPS SESSION FOR ASSESSMENT OF ULTRASOUND PROFICIENCY, KINDLY RESPOND TO THE FOLLOWING QUESTIONS BY SELECTING ONE OPTION:

<table>
<thead>
<tr>
<th></th>
<th>STRONGLY AGREE</th>
<th>AGREE</th>
<th>DO NOT KNOW</th>
<th>DISAGREE</th>
<th>STRONGLY DISAGREE</th>
</tr>
</thead>
<tbody>
<tr>
<td>1) Do you think the DOPS session is useful as an assessment tool for your skills</td>
<td></td>
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<td>2) Do you think DOPS is a better tool to judge your skills in comparison to conventional end of rotation feedback</td>
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<tr>
<td>3) Would you like DOPS to totally replace conventional feedback</td>
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<td>4) Do you personally agree with the results being an appropriate judgement of your skills</td>
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<td>5) Do you wish for DOPS sessions to be continued in the future</td>
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<tr>
<td>6) Do you think the DOPS session has resulted in increased confidence level</td>
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<tr>
<td>7) Do you think the results are discouraging resulting in a feeling of self doubt relating specifically to ultrasound performance</td>
<td></td>
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<tr>
<td>8) Do you think DOPS session should be carried out in a pre planned manner Do you think this experience has helped you in identifying flaws in your technique</td>
<td></td>
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</tr>
</tbody>
</table>

Figure 4. Questionnaire sample provided to residents for feedback.

Fig. 4
Conclusion

Results:

• Junior resident performance in DOPS session:

All junior residents participated in the DOPS session. Final assessment of results showed that seventy five percent of first year residents' performance was ranked as 'satisfactory' while 25% were ranked as 'good'. (Fig. 5)

• Resident feedback:

All senior residents answered the questionnaire. Seventy one percent residents thought that this new tool is 'moderately effective' in improving ultrasound proficiency in first year residents while 26% rated it to be 'very effective' while 13% thought that DOPS and other methods are 'equally effective'. (Fig. 6)

• Conventional assessment vs. DOPS: Which is better? Resident opinion:

Hundred percentage think it to be better than conventional end of rotation written feedback and should be implemented in other areas of radiology as well. (Figure 7)

• Seventy percent of residents 'strongly agree' with the idea of implementing DOPS in the future as well while 16% 'agree' to it. (Fig. 8)

• Senior resident view regarding effect of DOPS on on-call junior resident performance:

Eighty six percent of senior residents felt that there was improvement in procedural skills of junior first year resident during call hours after implementation of DOPS as compared to junior residents from previous batches. (Fig. 9)

• Resident opinion about utility of DOPS in other imaging modalities:
When asked to give open suggestions regarding use of utility in other imaging modalities, a significant portion of residents showed their enthusiasm in implementing DOPS in other sub specialties as well, with greater majority preferring its implementation in the future in fluoroscopy. (Fig. 10).

**Conclusion:**

Compared to our conventional end of rotation written feedback, the change to Direct Observation of Procedural Skills (DOPS) for assessment of ultrasound of first year residents has been found to be a useful assessment tool that can be implemented in other areas of radiology as well.

**Images for this section:**

![Figure 5. Graph showing the performance of junior residents in DOPS session](image-url)
Figure 6. Graph depicting senior resident response on effectiveness of DOPS in improving on-call ultrasound proficiency of junior residents.

Fig. 6
Figure 7. Graph depicting views of residents comparing both conventional and DOPS in terms of a better assessment method.

Fig. 7
Figure 8. Graph depicting residents' view on their opinion regarding future implementation of DOPS.
Figure 9. Senior resident view regarding effect of DOPS in improving on-call junior resident performance.
**Figure 10.** Resident opinion about utility of DOPS in other imaging modalities
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References


