Fine needle aspiration biopsy: An entrustable professional activity in cytopathology postgraduate training

ABSTRACT

Context: In the context of competency-based medical education being advocated worldwide, fine needle aspiration biopsy (FNAB) is considered as an entrustable professional activity (EPA). There is no information regarding how much time and training are required to achieve a “competent level” for performing and documenting FNAB in the Indian context.

Aim: To determine the time taken by an average postgraduate pathology trainee to become competent in performing FNAB with respect to history taking, clinical examination, and fine needle aspirate adequacy.

Settings and Design: A descriptive, retrospective, chart-based audit was conducted in the Department of Pathology.

Materials and Methods: FNAB chart records documented during 3 years of postgraduate training by a cohort of 13 postgraduate (PG) resident trainees admitted in 2010 were included in the study. Adequacy rates and criteria for adequacy were defined for the purpose of the study.

Statistical Analysis: Data was entered in MS Excel and analyzed using the Statistical Package for the Social Sciences version 20.0. The adequacy rates are presented as percentages and time taken to achieve adequacy rates as median values.

Results: A total of 3272 charts were audited. Median time taken to achieve 85% adequacy rate for history taking, for clinical examination by the first and the second criteria, and for FNAB were 1 month, 1 month and 3.5 months, and 1 month, respectively.

Conclusions: Although the mean time taken to achieve 85% adequacy rates for FNAB was 1 month, there was wide variation in the time durations between the residents to achieve this level.

Key words: Clinical competence; competency-based education; fine-needle aspiration biopsy; medical residency; pathology

Introduction

Mirroring the world-wide shift to competency-based curricula, the Medical Council of India (MCI) has also listed several competencies desirable in an Indian Medical Graduate (IMG). Current pedagogical thinking emphasizes imparting an education at the end of which the trainee will emerge equipped with a set of competencies drawing on the trinity of knowledge, skills, and attitudes, rather than any of these in isolation.[1]

Competencies are broad abilities of a physician; they can be achieved through mastering individual tasks called entrustable professional activities (EPA). An EPA, in turn, is a specialized skill that is vital for competent performance of the physician (Upreet et al. Indian Pediatrics).[2] EPAs are tasks that must ultimately be performed unsupervised in the workplace; therefore, increasing degrees of trust, from novice to proficient, must be earned by the trainee as the training progresses.[2] Fine needle aspiration biopsy (FNAB)
fulfils all the criteria necessary for to qualify for an EPA. It is an essential task performed by a cytopathologist, it is observable, and the outcome can be measured. In an FNAB clinic, a postgraduate trainee is required to examine the patient, to elicit the relevant history and physical signs, and to document these findings. Finally, they are required to perform the aspiration well enough to obtain a smear of sufficient cellularity on which a diagnosis is possible. To be performed competently during a patient encounter the task requires appropriate medical knowledge, psychomotor skills, and attitudes.

Learning curves within a cohort of trainees may vary as may their learning needs. Our training programs, however, are rigid structures with defined time limits. In our institution, the trainees are rostered through different sections of the department such that by the end of their 3-year postgraduate course each of them has been posted in cytopathology for a total of between 6 and 10 months. There is no information regarding how much time and training are required to achieve a “competent level” for performing and documenting FNAB in the Indian context. If available, this information would facilitate decision making and the development of guidelines for training and assessing FNAB as an EPA in pathology postgraduate medical education. Therefore, this study was conducted to determine the time taken by an average postgraduate pathology trainee to become competent in performing FNAB.

Materials and Methods

A descriptive, retrospective, chart-based audit was conducted in the cytopathology section of the Department of Pathology during November 2013 to April 2015. All the FNAB chart records documented during their 3 years of postgraduate training by a cohort of 13 postgraduate resident trainees admitted in 2010 were included in the study.

Throughout their 3-year course duration of postgraduation, the postgraduate trainees are posted in cytopathology section for a period of approximately 10 months by monthly rotation postings. During these postings, they take the clinical history, perform the clinical examination, and perform FNABs. FNAB was done under supervision of peers such as senior residents but not of senior faculty. Its learning by performing an approach that is followed. The FNAB charts were retrieved from the archives of the Cytopathology Section, Department of Pathology.

Being a chart-based audit, it rests on the assumption that what was documented, was asked or observed, and what has not been documented has not been asked or observed. The proformas for history taking and clinical examination used in the outpatient departments do not include a checklist.

To be labeled as competent in performing FNABs, taking history, and doing the performing examination, the postgraduate student should meet the adequacy criteria regarding these tasks in 85% of the FNAB forms documented by them in a given month.

Adequacy rate is the proportion of FNA records meeting the adequacy criteria developed for the purpose of this study. It was calculated as: \( \frac{a}{b} \times 100 \), where \( a \) is the number of FNAB record forms meeting the adequacy criteria and \( b \) is the total number of FNAB record forms evaluated. It was presented as \( a/b \) and percentages.

The earliest month in which the cutoff of 85% was achieved was considered as the time taken (in months) to achieve competency for that particular task. The months in which the PG student performed less than 10 biopsies were not considered for conferring the competency level.

The checklist given below was devised for the purposes of this study.

Adequacy criteria for FNAB: If a diagnostic report was returned, it was assumed that the cellularity of the FNAB was adequate to arrive at the diagnosis.

Adequacy criteria for history taking: Five components mentioned below were considered for adequacy in history taking. To be considered as adequate, out of the five components given below, the first was mandatory along with at least one of the remaining four components.

1. Duration.
2. Mode of onset.
3. Associated symptoms (e.g., dysphagia, hoarseness of voice).
4. Past history.
5. Family history.

Adequacy criteria for clinical examination (Inspection and palpation): Fourteen components mentioned below were considered for adequacy in clinical examination.

Two sets of adequacy criteria (criteria set 1 and 2) were devised for clinical examination. To be adequate by the 1st set of criteria, the first four components along with at least two of the remaining ten components were to be met. For the 2nd set of criteria, the first four and the last two (13 and 14) components along with at least two of the remaining eight components were to be met for being labeled as an adequate clinical examination.
1. Location.
2. Size.
3. Shape.
4. Extent.
5. Color.
6. Skin over swelling.
7. Movement with deglutition (Anterior midline neck swellings).
8. Movement with protrusion of tongue (Anterior midline neck swellings).
9. Presence/Absence of tenderness.
10. Consistency.
11. Relation to surrounding structures.
12. Movement/fixedness of swelling.
13. Working clinical diagnosis derived from the clinical examination.
14. Relevance to cytological diagnosis.

Criteria for achieving EPA

1. Adequacy rate of 85% history taking.
2. Adequacy rate of 85% clinical examination.
3. FNA adequacy rate of 85%.

The study was approved by the Institutional Ethics Committee. The anonymity of the postgraduates was maintained through coding from numbers 1–13, and the same coding was used all throughout the study. The data collected were kept confidential and used only for the purpose of the study.

Data were entered in Microsoft Excel spreadsheet and analyzed using the Statistical Package for the Social Sciences (SPSS), version 20.0 for Windows, IBM Corp. Released 2011, Armonk, New York. The adequacy rates are in the form of percentages. The time duration in months have been presented as median values.

Primary outcome measure:

Average time taken (in months) to become competent in performing FNAB.

Secondary outcome measure:

Average time taken (in months) to become competent in clinical examination.

Results

Three thousand two hundred and seventy-two FNAB documented by the cohort of 13 postgraduate trainees admitted in the year 2010 through their 3 years of postgraduation were assessed to determine the time taken to achieve an adequacy rate of 85% for history taking, clinical examination, and performing FNAB with sufficient cellularity to make a diagnosis.

Median time duration taken to achieve 85% adequacy rate for history taking, for clinical examination by the first and for the second set of criteria, and for FNAB are shown in Figure 1. One student did not achieve the adequacy rate of 85% for clinical examination by the second set of criteria in any of the months throughout her 3 years of postgraduate training.

Median time taken to achieve 85%, 90%, and 95% FNAB adequacy rates was 1, 3.5, and 4 months, respectively.

Increasing the cut-off to 90% resulted in longer time taken for the achievement of adequacy rates from 8/13 to 3/13 by the end of the first month, 5/13 by the end of the second month, 6/13 by the end of the third, 10/13 by the end of the fourth month. One out of the 13 students never reached the cut-off. Increasing the cut-off still further to 95% resulted in a still longer time; the target being achieved only by 8 trainees.

The variation in the number of FNAB performed by the trainees is shown in Table 1. Over 3 years, the numbers ranged from a low of 104 to a high of 405.

Eight out of 13 postgraduates achieved the acceptable adequacy rate in FNA by the end of the first month. Three out of 13 postgraduates had achieved the acceptable adequacy rate by the end of the second month. Two out of
13 postgraduates had achieved the acceptable adequacy rate at the end of the third and fourth months.

Having achieved 85% adequacy rates once, however, these rates were not consistently maintained; falling to below 85% in 21/98 trainee months in subsequent months (lowest 75%).

Discussion

Assessment of postgraduate pathology trainees in India is summative and subjective. Assessment of the knowledge component is by a theory examination, and global assessment is by a practical examination, in which mainly diagnostic ability is assessed through slide reading. Specific competencies such as the ability to perform FNAB are not assessed.

FNAB, an essential component of postgraduate training in cytopathology, is recognized as an EPA. It is an essential, trainable task performed by a cytopathologist, which is independently executable, observable, and measurable. With the advent of a competency-based curriculum, it will be necessary to define a reasonable, evidence-based time range for attainment of various competencies because it is unlikely that the curriculum will not be time-limited.

Learning may be very variable across trainees. Arbitrary time cut-offs for attaining an EPA run the risk of being over or underambitious, and may result in inappropriate advantage to rapid learners, avoidable discouragement to slow learners, or vice versa. In this study, we have attempted to determine a realistic time range, based on documented performance of a cohort of trainees, in which proficiency of FNAB can be achieved by an average trainee.

In our institution, we follow a loosely structured, unwritten training schedule for cytopathology trainees in the FNAB clinic. New entrants learn by observing their seniors and peers and are provided advice and help if and when they venture to ask, and mostly select their own learning trajectory that is never formally assessed. Occasionally, a concerned senior may delegate what she perceives as “easy” patients, often the larger lesions, to the new-comer. By auditing the charts filled in by a cohort of residents who had trained in the system described above we hoped to gain some insight into their learning curves for subcompetencies such as the time they took to attain proficiency in history taking, clinical examination, and achieve cellular aspirates adequate for a diagnostic report necessary for FNAB. We reckoned that this might be a valuable database for comparison when change to a competency based curriculum is implemented.

The inequalities in the learning opportunities utilized by the trainees [Table 1] are reflected by the very variable numbers of FNAB conducted in the first year (range 9–145), and during the 3 years of training (range 104–405). When designing the audit, we did not foresee such extreme variability. After all, this cohort of trainees had all performed well enough at the summative MD examination to have passed in the first attempt. We assumed that they would all have displayed near-uniform degree of competence, and that it was only a matter of time before they did. It now appears reasonable to assume that for the beginner, at least to a limit, the learning curve would be proportionate to the number of procedures performed; however, this study was not designed to determine the minimum numbers of FNAB necessary for a trainee to achieve a desired level of competency. We have no guidelines regarding the minimum number of FNAB to be conducted by each trainee, and therefore, it falls upon the trainee herself to decide the number that she should do or is able to. While self-learning and setting individual learning goals and growth curves are attractive theoretical educational constructs suited to the emerging concept of a competency-based curriculum that is not time-bound, they do not address the issue of how long a trainee might carry on at unacceptable levels if she is unable to achieve a given target level of competency. There may be various intrinsic and extrinsic factors, such as absences due to illness, maternity and starting a family, preoccupation with other work such as the thesis, and inability to cope with work pressures, which might affect the total number of FNAB performed by the PG student.

The criteria used for the history taking and criteria set 1 clinical examination competencies pertain to the lower cognitive domains of recall and comprehension, as described
Kumar, et al.: FNAB as an entrustable professional activity

in Bloom’s taxonomy of learning domains.[8] These criteria reflect what may be considered the minimum level skills required of a successful medical undergraduate. At the time of joining the postgraduate course, we found that trainees already possessed the basic skills of history taking and (criteria set 1) clinical examination [Figure 1].

When the second set of criteria for clinical examination, which required skills of higher cognitive domain such as analysis and synthesis of knowledge were applied, the time taken to achieve adequacy rates increased. Interestingly, even without specific instruction in the use of Bloom’s taxonomy, with time some trainees were already working at higher levels of cognition in relation to the task. The checklists devised for this study could be used to develop an Objective Structured Clinical Examination (OSCE) or Objective Structured Long Examination Record (OSLER) in Pathology as an assessment tool.

Documentation of clinical examination findings by the second set of criteria – a working clinical diagnosis and its ultimate relevance to the cytological diagnosis – are important prerequisites for interpretation of the microscopic findings. Cytopathologists know that it may be difficult and often impossible to interpret microscopic cytological findings in a clinical vacuum or in an inaccurate or misleading clinical context. Although to an astute cytopathologist a clinical–cytological mismatch may be a clue to a diagnostic error, often much time is lost in the diagnostic continuum when this is the case. If specific instruction had been given to the trainees regarding the higher cognitive level skills needed for the task, it is possible that they might have performed better earlier in their learning trajectory.

A change in the curriculum, like one from the existing traditional discipline based to one that is competency based, must not result in a fall in the standard of medical care available to the patients. For this reason, we defined 85% cut-off limit from existing data gathered from a previous audit carried out to study the rates of repeat FNAB.[6] This cut-off may have been set too low, and given improvements in the training environment, may be raised. We attempted to determine the effect of increasing the cut-offs for adequacy. Increasing the cut-offs resulted in a right shift in achievement of the competency by the trainees [Figure 2].

Our data shows that higher cut-offs are achievable in an environment even when there is no structured training system in place. Arguably, if a carefully designed training system with periodic evaluations were in place, higher competency levels, perhaps 95%, can be achieved. EPAs are tasks that must ultimately be performed unsupervised in the workplace; therefore, increasing degrees of trust must be earned by the trainee as the training progresses from novice to proficient. The trade-off for higher level of proficiency may well be longer duration of supervised training. Implementing this in the workplace would entail periodic audits of trainees’ performance like the one described in this paper. The trainee may be allowed unsupervised work with real patients only when she consistently demonstrates the target level of competence over a period of time defined by the supervisors of the program.

Our trainees learn on real patients; the price that we pay is the quality of patient care. An inadequate aspirate interrupts the continuum of care and is not beneficial to the patient, thus threatening to breach one of the fundamental principles of medical ethics, i.e. beneficence. One way to overcome this is to begin the residents’ training with simulated learning models e.g. mannequins.[9] It is in the interest of all the stakeholders – trainers, trainees, and patients alike – that the maximum achievable adequacy rate be reached at the earliest without causing harm to the patient. FNAB is essentially a blind procedure. The desirable outcome – a diagnostic report – can never be guaranteed all the time; at the same time, it must be maintained at or as near maximum as possible, a figure that is likely to vary from laboratory to laboratory. Each institution must, therefore, define its own parameters before embarking on change.

In cytopathology training, with the introduction of a competency-based curriculum, FNAB will be an EPA, around which training will be centered. This study shows that a postgraduate starts the training with adequate baseline skills, however, the acquisition of higher level skills may need to be actively incorporated into the postgraduate training programme. We recommend that direct faculty supervision of new residents should be instituted. A structured schedule with
identification of individual milestones for formative assessment must be devised. Competency-based medical education (CBME) model in its pure form advocates time-independent learning, whereas the current curricular system in India is time-dependent. In a time-dependent curriculum, the learner plots the course for progression of competence through rotations; in a time-independent curriculum, the learner plots the course for progression of competencies through activities. In our time-dependent system, hybrid models may have to be used in implementation.10

Conclusion

We conclude that the introduction of competency-based curriculum will require identification of EPA for pathology postgraduate education. The methods used in the study may be used as tools of teaching as well as for the assessment of cytopathology training.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

References

1. Medical Council of India. Vision 2015. Medical Council of India. New Delhi, India. Available at: http://www.mciindia.org/tools/announcement/MCI_booklet.pdf. [Last accessed on March 14 2016].
2. Dhaliwal U, Gupta P, Singh T. Entrustable Professional Activities: Teaching and Assessing Clinical Competence. Indian Pediatr 2015;52:591-7.
3. Ten Cate O. Nuts and bolts of Entrustable Professional Activities. J Grad Med Educ 2013;5:157-8.
4. The Accreditation Council for Graduate Medical Education and the American Board of Pathology. The Cytopathology Milestone Project. A Joint Initiative of The Accreditation Council for Graduate Medical Education and the American Board of Pathology. July 2015. Available online: https://www.acgme.org/acgmeweb/portals/0/pdfs/milestones/cytopathologymilestones.pdf. [Last accessed on March 14 2016].
5. Frank JR, Snell LS, Cate OT, Holmboe ES, Carraccio C, Swing SR, et al. Competency-based medical education: Theory to practice. Med Teach 2010;32:638-45.
6. Goyal R, Garg PK, Bhatia A, Arora VK, Singh N. Clinical audit of repeat fine needle aspiration in a general cytopathology service. J Cytol 2014;31:1-6.
7. Das S. Examination of Swelling. In: Das S, editor. A Manual of Clinical surgery. 6th ed. Kolkata: S Das Publishers; 2007. pp. 17-44.
8. Bloom B, Englehart M, Furst E, Hill W, Krathwohl D. Taxonomy of educational objectives: The classification of educational goals. Handbook I: Cognitive domain. New York, Toronto: Longmans, Green; 1956.
9. Mendiratta-Lala M, Williams T, Quadros Nishant de, Bonnett J and Mendiratta V. The Use of a Simulation Center to Improve Resident Proficiency in Performing Ultrasound-Guided Procedures. Acad Radiol 2010;17:535-40.
10. Royal College of Physicians and Surgeons of Canada. Competency-based Medical Education. A White Paper Prepared for the Royal College of Physicians and Surgeons of Canada, Future of Medical Education in Canada. Draft Jan 31 2011. Available online: http://www.royalcollege.ca/portal/page/portal/rc/common/documents/educational_initiatives/cbme.pdf. [Last accessed on March 14 2016].