

Medical students performing lumbar punctures: are we doing enough?

Yassar A Alamri

Abstract

It is safe to suggest that every medical student in their clinical years (and certainly every doctor) should be able to act alone in emergency situations and with limited resources. This includes supporting life functions, performing diagnostic procedures, establishing a clinical diagnosis, and/or initiating treatment. However, medical school curricula do not always cater for such demands. Lumbar puncture is a basic procedure performed routinely in emergency departments, neurology wards and elsewhere in hospitals. Medical students, however, do not usually get the chance to perform lumbar punctures during their basic training. In fact, Australian and New Zealand medical students seem to get the least exposure when compared to other students in other developed countries. This article examines the current status of medical students performing lumbar punctures around the world, and the ethical considerations around this issue.

Medical students are required to achieve certain clinical and procedural competencies before they graduate. However, defining what constitutes a 'competency' or when a student can be deemed competent has been challenging, and clear guidelines are generally still lacking. Moreover, a student's definition of competence can substantially differ from that of supervising personnel.¹

In a broad sense however, it is safe to suggest that every medical student in their clinical years (and certainly every doctor) should be able to act alone in emergency situations and with limited resources. This includes supporting life functions, performing diagnostic procedures, establishing a clinical diagnosis, and/or initiating treatment.²

While clinical knowledge can often be obtained from ward-rounds and bedside-teaching, procedural skills require more than that. Familiarising students with a procedure and getting them to perform it under appropriate supervision is crucial to students reaching procedural competence. This process should start in medical school and later be reinforced during postgraduate studies.³

Why is it an important issue?

Lumbar puncture (LP) is a basic procedure performed routinely in emergency departments (EDs), neurology wards and elsewhere in hospitals. It is one of the most difficult procedures in medicine because it requires specialised equipment and a highly skilled practitioner.

When a cohort of US third-year medical students was surveyed, LP was a skill that they perceived to be highly important, but that they commonly lacked confidence in.⁴ When the same cohort were surveyed again toward the end of their fourth year, there

was a significant increase in the number of students performing LPs, as well as in students' self-confidence in the skill.⁵ However, similar results were not reproduced in another survey of fourth-year medical students.⁶

Still unfortunately, this has not changed the way that this important procedure is taught to medical students, or how often they are given the opportunity to perform it. Junior residents have been observed to make frequent errors while performing LPs, as they are seldom adequately prepared for the task as medical students.^{7,8} Therefore, junior housestaff will have to have gained some prior competency with such a skill if they are expected to perform it comfortably later in their careers.⁹

Medical students performing lumbar punctures

In 2002, the Institute for International Medical Education issued a report on the global minimum essential requirements in medical education. It stated that a medical graduate must be able to “apply basic diagnostic and technical procedures” and to “perform appropriate diagnostic and therapeutic strategies” to diagnose patients effectively and efficiently.¹⁰ These guidelines have been extrapolated to include LPs, as can be seen in the published literature.¹¹

United States—Almost all the published literature that discusses medical students performing LPs comes from the USA. In their learning objectives for medical student education, the Association of American Medical Colleges acknowledges that before graduation students should be able to perform routine technical procedures (including LPs).¹² In a sample of 698 senior medical students from various medical schools throughout the USA, an average of 90% of the students rated themselves as adequate or very adequate in performing LPs.¹³ Furthermore, when 100 medical students were asked about performing procedures during their third year, only 22% stated that they had not performed an LP yet.¹⁴

Australia—Data from outside the USA is less robust. A recent survey targeted a random sample of interns graduating from one of New South Wales' three medical schools.¹⁵ They were asked to indicate whether they would have liked more medical education before graduating on any of 226 core skills. These core skills were identified as ‘required at graduation’ by reviewing the relevant literature as well as consulting intern supervisors, discipline heads, hospital nurses, registrars and interns. These skills were divided into five groups: clinical conditions, investigations, procedures, core practice and professional development. Performing an LP topped the investigations list and was among the 20 most frequently acknowledged skills identified as needing more medical school preparation.¹⁵

New Zealand—Performing an LP appears as an ‘important procedural skill’ in students' logbooks and skill development manuals in New Zealand medical schools. For example, the Canterbury District Health Board has developed an LP skill development package, specifically targeting supervised medical students.¹⁶

Disappointingly however, medical students in New Zealand very rarely get the chance to perform LPs. A survey of 93 skills was conducted to examine any differences experienced by traditional hospital-based versus rural medical students.

The survey covered a group of fifth-year students located at several different campuses of the University of Otago. LP was one of only four skills (i.e. alongside

venous cut down, needle thoracocentesis and cricothyroidotomy) of which no students at any location reported any hands-on experience.¹⁷

Taiwan—In a review of 207 logbooks of 7th year medical students in Taiwan, 49% stated that they did not learn well through observing an LP. The authors of the study concluded that students should be given structured opportunities to practice the required clinical and procedural skills to increase their learning outcome.¹¹

Nepal—In a survey of 59 medical students' perceptions and attainment of certain clinical and procedural skills, 20.4% have performed one to five LPs before graduation. However, only two students felt confident about performing LPs on patients.¹⁸

Issues surrounding medical students performing lumbar punctures

Impact of experience on errors and complications—The experience level of the personnel performing an LP is directly related to the number of technical errors that will occur when performing the procedure,⁷ but not with the rate of complications. Although this may seem counterintuitive, the common belief that a practitioner's level of experience will correlate with the incidence of complications is only an assumption; data are lacking to support this assumption.¹⁹ Therefore, allowing students to perform such a procedure is key and 'practice makes perfect'; arguing that letting students practice LPs will *harm* patients is therefore refuted.

When asked about the number of times the procedure needs to be performed for the student to reach complete competence, PGY1 residents estimated an average of 8.1, while consultants estimated an average of 6.9.¹ Moreover, Wu and his colleagues have found that there is a positive relationship between the frequency of performing a procedure (such as an LP) and the practitioner's level of self-confidence in it.⁴ They have also suggested that proper teaching, formal assessment and the addition of curricular material about the procedure will increase the likelihood of students performing it more often.^{4,8} Furthermore, students who worked with the same attending for longer periods (e.g. more shifts in the ED) were found to have performed significantly more procedures than their peers who did not.³

Simulation-based learning was found to improve the technical skills of students performing LPs.²⁰ However, this did not change patients' attitudes toward having their LP performed by a medical student.²¹

Patients' attitudes and opinions toward medical students performing lumbar punctures—If given the chance to anonymously make a decision without having to confront an authority figure, most patients would not agree to be the subject of a medical student's first procedure, no matter what it is.²² However, unless there are very specific reasons, information should never be held back from a patient, and their autonomy should be respected at all times.

Withholding information that an LP is the student's first is a form of deception, and is generally unjustifiable—even if it is for a 'good reason' (such as training future doctors). Jeopardising the autonomy of a *present* patient for the potential benefit of a *future* patient is ethically unacceptable. This is because the practitioner has a stronger obligation to the present patient; future patients may never exist.¹⁹

When 173 patients were surveyed about whether they would be willing to be the subject of a student's first LP, 52% said they would be. The number increased to 61% when the patients were asked beforehand and were told that the students would be under *close* supervision. When the rest of the population was investigated, it was found that much of the reluctance was attributable to poor patient understanding of the procedure and its complications. For example, half the patients erroneously thought that there was a high risk of paralysis. Therefore, better patient education and further development of policy boards would enhance the patient response.¹⁹

Another study found that patients who have a longer working relationship with a medical student are more willing to agree than patients who do not (such as patients seen in EDs). Interestingly, the type of medical insurance patients hold (i.e. self-pay, personal-insurance or government-insurance) does not seem to make them any more or less likely to agree.²²

Lastly, for medical students' first procedures, some have suggested targeting a selected population such as willing young patients, or cancer patients who will have had many LPs before.¹⁹ While this can ultimately result in increased patient numbers (i.e. more who are likely to agree), this would place an undo burden on this segment of the patient population for the benefit of others. Nobody ideally wants to be a medical student's first patient, and everybody wants to receive care from the best-trained doctors; however, these two goals are contradictory and are almost mutually exclusive!

Therefore, the ultimate goal should be trying to distribute the burden/risk of medical education as impartially as possible among all in society. This means educating patients about why they may wish to give up some autonomy and consent to having procedures done by *properly* supervised students.^{21,22}

Conclusion: main messages and what next?

Graduating medical students are expected to perform at a certain level, for which they are not always adequately prepared. LP, an important diagnostic and therapeutic procedure, is rarely performed by medical students in New Zealand and Australia before graduation.

Medical students performing LPs, and other manual procedures, can be ethically justified, given that a number of patients would be willing to sacrifice some autonomy in order to train future doctors. Perhaps a step-wise plan to achieving this, by protecting some curriculum time and making use of simulations and logbooks, will result in higher numbers of medical students performing an LP before graduation.

Competing interests: None declared.

Author information: Yassar A S Alamri, Medical Student, University of Otago, Christchurch

Correspondence: Yassar A S Alamri, New Zealand Brain Research Institute, 66 Stewart Street, Christchurch 8011, New Zealand. Email:

yassar.alamri@vanderveer.org.nz

References:

1. Lammers RL, Temple KJ, Wagner MJ, Ray D. Competence of new emergency medicine residents in the performance of lumbar punctures. *Acad Emerg Med*. 2005 Jul;12(7):622-8.
2. Hunskaar S, Seim SH. Medical students' experiences in medical emergency procedures upon qualification. *Med Educ*. 1985 Jul;19(4):294-8.
3. Perez E, Rabrich J, Shah KH. Medical student procedures and attending faculty exposure. *Emerg Med J*. Jun 1.
4. Wu EH, Elnicki DM, Alper EJ, et al. Procedural and interpretive skills of medical students: experiences and attitudes of third-year students. *Acad Med*. 2006 Oct;81(10 Suppl):S48-51.
5. Wu EH, Elnicki DM, Alper EJ, et al. Procedural and interpretive skills of medical students: experiences and attitudes of fourth-year students. *Acad Med*. 2008 Oct;83(10 Suppl):S63-7.
6. Coberly L, Goldenhar LM. Ready or not, here they come: acting interns' experience and perceived competency performing basic medical procedures. *J Gen Intern Med*. 2007 Apr;22(4):491-4.
7. Aloia JF, Esswein AJ, Weissman MB. House staff performance of the lumbar puncture as a measure of clinical skills teaching. *J Med Educ*. 1977 Aug;52(8):689-90.
8. Elnicki DM, Shumway JM, Halbritter KA, Morris DK. Interpretive and procedural skills of the internal medicine clerkship: performance and supervision. *South Med J*. 1996 Jun;89(6):603-8.
9. Elnicki DM, van Londen J, Hemmer PA, et al. U.S. and Canadian internal medicine clerkship directors' opinions about teaching procedural and interpretive skills to medical students. *Acad Med*. 2004 Nov;79(11):1108-13.
10. Core Committee IfIME. Global minimum essential requirements in medical education. *Med Teach*. 2002 Mar;24(2):130-5.
11. Chu TS, Chang SC, Hsieh BS. The learning of 7th year medical students at internal medical--evaluation by logbooks. *Ann Acad Med Singapore*. 2008 Dec;37(12):1002-7.
12. Association of American Medical Colleges. Learning objectives for medical student education--Guidelines for medical schools: Report I of the Medical School Objectives Project. *Acad Med*. 1999;74:13-8.
13. Bruhn JG, Epstein BS, Burnap TK. Senior medical students' knowledge of and attitudes toward anesthesiology in ten medical schools. *Anesthesiology*. 1973 Jul;39(1):94-103.
14. Fincher RM, Lewis LA. Learning, experience, and self-assessment of competence of third-year medical students in performing bedside procedures. *Acad Med*. 1994 Apr;69(4):291-5.
15. Rolfe IE, Pearson S, Sanson-Fisher RW, Ringland C. Identifying Medical School Learning Needs: A Survey of Australian Interns. *Education for Health*. 2001;14(3):395-404.
16. Fink J, Parkin P, Inglis S, et al. Skill Development Package: Lumbar Puncture. In: Canterbury District Health Board CSU, editor. 2003.
17. Tordoff R. The Experience of Rural Medical Students in New Zealand. Dunedin: University of Otago; 2008.
18. Agrawal CS, Agrawal S, Sharma S. Perception of final-year medical students about skills attainment in a new medical school of Nepal. *Nepal Med Coll J*. 2005 Jun;7(1):58-61.
19. Williams CT, Fost N. Ethical considerations surrounding first time procedures: a study and analysis of patient attitudes toward spinal taps by students. *Kennedy Inst Ethics J*. 1992 Sep;2(3):217-31.
20. Lenchus JD. End of the "see one, do one, teach one" era: the next generation of invasive bedside procedural instruction. *J Am Osteopath Assoc*. Jun;110(6):340-6.
21. Graber MA, Wyatt C, Kasperek L, Xu Y. Does simulator training for medical students change patient opinions and attitudes toward medical student procedures in the emergency department? *Acad Emerg Med*. 2005 Jul;12(7):635-9.
22. Graber MA, Pierre J, Charlton M. Patient opinions and attitudes toward medical student procedures in the emergency department. *Acad Emerg Med*. 2003 Dec;10(12):1329-33.