

## Development and Evaluation of a Mandatory Course in Geriatric Medicine for Fourth Year Medical Students

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**Background and Objectives:** As the population ages, older adults will make up an increasing proportion of the practices of most physicians. Because of this, education of medical students in Geriatric Medicine is essential, yet there is considerable variability in the amount, timing within the curriculum, and content of geriatric training in Medical Schools. Our goal was to develop and evaluate an integrated, mandatory 3-week geriatric medicine course for fourth year medical students with emphasis on knowledge acquisition.

**Methods:** All fourth year medical students at Dalhousie Medical School underwent 2 ½ days of didactic teaching on core geriatric topics and a 2-week clinical rotation. Pre-rotation knowledge testing occurred on the first day of the rotation. On the final examination, students were retested on the 15 pre-rotation questions, as well as 5 additional questions that they had not encountered previously.

**Results:** There was a statistically significant improvement in examination performance from 46.9% on the pretest to 78.6% on the final examination ( $t=24.7$ ,  $p<.001$ ). It is unlikely that the significant improvement in scores is simply a result of repeat testing, as students tended to score better on the five additional questions that they had not seen before.

**Discussion:** We developed a geriatric medicine course for fourth year medical students, in one integrated 3-week block, using a combination of didactic teaching and clinical encounters. We used students as their own controls, using the same questions pre- and post-rotation, and demonstrated significant knowledge acquisition on a variety of topics pertaining to geriatric medicine and care of the older patient. Future research should address the issue of translating acquired knowledge in geriatric medicine into demonstrated clinical skills when caring for the elderly.

Education of medical students in Geriatric Medicine has gained increasing attention in recent years. As the population ages, older adults will make up a substantial proportion of the practices of most graduating physicians. People over the age of 65 have more than twice the frequency of contacts with physicians as younger adults, and account for approximately half of all hospital days.<sup>1</sup> Surveys of graduating American<sup>2,3</sup> and Canadian<sup>4</sup> medical students indicate that most new physicians feel that they have received inadequate exposure to Geriatric Medicine. Despite the importance of Geriatric Medicine education, there is considerable variability in the amount, timing within the curriculum, and content of geriatric training in Canadian Medical Schools.<sup>4</sup>

Previous reviews of the literature have concluded that negative attitudes toward older people are pervasive amongst medical students and other health professionals.<sup>5,6</sup> Educational programs aimed solely at increasing knowledge of Geriatric Medicine have had variable impact on improving attitudes.<sup>7-16</sup> Clinical encounters with elderly patients may more predictably result in improved attitudes toward older people.<sup>5,7,17</sup> Programs

which primarily provide medical students with exposure to older adults in a variety of clinical contexts have been shown to have a positive effect on students' sensitivity to geriatric issues and attitudes toward aging,<sup>5,6,18-23</sup> as have those which provide exercises that allow students to experience sensory deprivation or disability.<sup>24-26</sup>

However, it can be argued that the most important goal of a mandatory geriatric medicine rotation is to increase medical students' knowledge of how to care for the frail elderly, and that acquisition of knowledge should be the main measure of effectiveness of such a program.<sup>7,8,17</sup> Most physicians will not choose geriatric medicine as their career, yet will need to be familiar with the principles of caring for elderly patients.<sup>27,28</sup>

A number of educational interventions designed to teach Geriatric Medicine content to medical students have been described, and a few have been tested with respect to knowledge acquisition. Most employ a combination of didactic and clinical teaching, although Swagerty et al<sup>29</sup> report on a web-based curriculum which, although apparently effective, requires considerable resources. One site compared students' scores on a post-test between

a group taught with a series of weekly sessions and another group who participated in one integrated geriatric medicine block.<sup>30</sup> Students were more satisfied with the integrated experience and demonstrated better knowledge acquisition. A number of trials have employed fairly intensive, combined clinical and didactic educational programs and demonstrated knowledge acquisition by comparing pre-course test performance to post-test scores,<sup>10-12</sup> including retention of knowledge one year later.<sup>14</sup> Translation of acquired knowledge to clinical skills has been demonstrated with post-course Objective Structured Clinical Examination (OSCE).<sup>13</sup> In contrast, other groups have demonstrated very little knowledge acquisition by comparing pre- and post-test scores.<sup>31,32</sup>

Our goal was to develop and evaluate an integrated, mandatory 3-week geriatric medicine course for fourth year medical students with an emphasis on knowledge acquisition. We combined didactic teaching with a clinical experience, as medical students enjoy actual clinical encounters and this may improve attitudes toward the elderly,<sup>5,17</sup> and the didactic component allowed us to cover core material with all students. We reviewed the relevant literature and referred to published curriculum guidelines<sup>33-35</sup> to develop an intensive educational experience, including 2½ days of didactic teaching, 2 weeks of clinical exposure, student presentations, and a pre- and post- course examination.

**Methods**

**Description of the Program** The 2004 fourth year class of Dalhousie Medical School was divided into 4 groups of approximately 22 students each, for a mandatory 3 week rotation in Geriatric Medicine. The first 2½ days consisted of lectures on core geriatric topics,<sup>36</sup> given by geriatricians or geriatric psychiatrists. Four hours were dedicated to cognitive disorders (delirium and dementia) and a practical approach to cognitive assessment as described in Mallery et al.<sup>3</sup> Other sessions reviewed important topics in geriatric medicine, such as comprehensive geriatric assessment, falls, and depression. Students attended a one-hour session with a physiotherapist to demonstrate how to mobilize patients, diagnose gait disorders and select walking aids. Table 1 outlines the lecture series and time allotment for each topic.

Students were then assigned to 2-week clinical rotations where they participated in patient care. The clinical experiences included an inpatient geriatric assessment unit, geriatric rehabilitation on an inpatient unit or in a geriatric day hospital setting, ambulatory clinics, inpatient geriatric consultations, or one-on-one teaching with a community-based family physician with a predominately geriatric practice. All students were required to write 3 case reports based on clinical

**Table 1 Lecture series given during first 2 ½ days of mandatory 3-week Geriatric Medicine rotation for 4<sup>th</sup> year medical students.**

Topic	Time commitment
Introduction, orientation, distribution of handouts and materials	1 hour
Representative clinical cases	1 ½ hours
Approach to comprehensive geriatric assessment and atypical disease presentation in the frail elderly	1 hour
Mobility and falls	1 hour
Exercise in the elderly	1 hour
Walking aids, gait disorders, and approach to transferring and ambulating patients	1 hour
Polypharmacy and medication review	1 ½ hours
Delirium	1 hour
Diagnosis	
Management	
Optimizing in-hospital care	
Depression in the elderly	1 hour
Cognition	4 hours
Approach to cognitive assessment	
Diagnosis of dementia	
Differential diagnosis of dementia	
Management of dementia: nonpharmacological and pharmacological	
Behavioral disturbances in dementia	

**Table 2. Sample question from students' exam\***

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Mrs. B. is an 86 year old woman who presents to the Emergency Room with confusion. Her past medical history includes osteoarthritis of her knees, a hip fracture 2 years ago, ischemic heart disease, hypothyroidism and occasional urge incontinence. Her present medications consist of acetaminophen prn, a multivitamin, metoprolol 50 mg bid, coated aspirin, and thyroxine 0.075 mg. She lives in her own home with the assistance of weekly home care for bathing and housework. She manages her own medications and can prepare light meals for herself. Her daughter helps with the grocery shopping and some meal preparation. Mrs. B. has used a walker since her hip fracture. On examination, her MMSE is 13/30. She has bilateral hearing aids. On auscultation of her chest, she has crackles at the left base. Cardiovascular exam reveals a JVP of 2 cm and a 2/6 systolic murmur. She has crepitus in her knees bilaterally. She is unable to cooperate fully with a neurological exam, but there are no focal findings. The chest x-ray shows left lower lobe pneumonia.

1. Name four clinical features that distinguish delirium from dementia.
2. What is your diagnosis for Mrs. B's confusion? Justify your answer.
3. What interventions are needed, and what common hospital practices should be avoided, to maximize her functional outcome?

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\* This question was not actually used on the examination, but is a typical example.

encounters, with one focusing on cognitive assessment, one describing an assessment of gait and mobility, and another one with a comprehensive medication review.

Students were provided with a syllabus that included objectives, selected reading materials covering key geriatric topics, and 14 case studies with discussion. Each student was required to prepare a 15 minute oral presentation on a geriatric medicine topic of their choice, which was presented to and evaluated by their peers and a geriatrician during the final days of the rotation.

**Evaluation** Pre-testing occurred on the first day of the rotation; all students responded to a 15-item short essay test on a variety of common geriatric topics. The final examination took place on the last day of the rotation. The students were retested on the 15 pre-rotation knowledge questions, as well as 5 additional questions that they had not encountered on the pretest, which were considered of equal difficulty and were selected from the same bank of questions. These questions were constructed by the authors and reviewed by 5 other geriatric specialists, with modifications if necessary. The questions had been trialed with students from the previous year. See Table 2 for a representative example from the question bank. Each group of students had the same 15 pre- and post-test questions. The same 15 questions were used on the post-rotation exam to allow for a direct comparison in performance before and after the educational experience. The 5 additional questions were different for each group. Students were not told that the pretest questions would be repeated. The specific answers were not discussed with the students, although the topics which were being tested were included in the course curriculum. Students' answers were graded by geriatricians using an answer key.

The pre- and post- test responses to each question were scored by only one rater (one geriatrician per question) using the answer key. Geriatricians were blinded as to which responses were pre- versus post-rotation exams.

**Statistical Analysis** Student's t-tests were performed to determine if there was a change in total grade achieved on the post-test compared to the repeated items on the pretest. To ensure that any improvement in test performance was not a function of improvement on only a few questions, t-tests were also performed on the marks of individual test items. Post-test scores on repeated items were compared to post-test scores on new final exam questions, to ascertain that improved test scores were due to acquisition of knowledge in Geriatric Medicine, rather than exposure to the same questions. Exam performance between groups was compared with analysis of variance.

## Results

There were 86 medical students in the clerkship year in 2004 at Dalhousie University. One student did not take the pre-test, leaving 85 students for analysis. Mean scores on individual exam items are shown in Table 3. There was statistically significant improvement ( $p < .001$ ) in performance by t-test on all 15 repeated short essay knowledge questions. Mean total exam score improved significantly from 46.9% on the pretest to 78.6% on the final exam ( $t=24.7, p < .001$ ). Mean grades on the 5 new questions were not systematically worse than the grades achieved on the questions that students had seen before. On the contrary, students in three of four groups performed better on the never-encountered questions than

**Table 3. Mean Scores on Individual Short Answer Questions Before and After a 3-Week Geriatric Medicine Rotation.**

Question	Pretest (%)	Post-test (%)	gain	t*
Diagnosis of delirium	40	82	42	14.4
Etiology of delirium	78	99	21	10.7
Management of Alzheimer's disease	31	64	33	10.3
Drugs to avoid in Lewy Body dementia	29	95	66	14.4
Pharmacological causes of delirium	40	95	55	9.6
Adverse effects of benzodiazepines	53	73	20	6.0
Medication compliance	75	88	13	5.0
Creatinine clearance	11	75	64	15.1
Depression in the elderly	49	74	25	9.0
Falls in the elderly	62	81	19	6.4
Walking aids	23	93	70	13.7
Iatrogenic issues	37	67	30	10.6
Life expectancy	53	73	20	9.7
Urinary incontinence	58	90	32	10.2
Urinary retention	55	81	26	8.8

\*All t-tests significant  $p < 0.001$ .

they did on the questions they had seen at the start of the rotation (Table 4). There was no statistically significant difference between groups on exam performance ( $F=1.87$ ,  $p=0.142$ ).

### Discussion

We developed a geriatric medicine course for fourth year medical students, in one integrated 3-week block, using a combination of didactic teaching and clinical encounters. Using pre and post rotation testing, we were able to demonstrate significant knowledge acquisition on a variety of topics pertaining to geriatric medicine and care of the older patient. We chose not to assess students' attitudes, as previous research has not shown a consistent relationship between knowledge acquisition and attitudinal change,<sup>7-16</sup> and it can be argued that increasing knowledge on principles of caring for the elderly should be considered the main outcome of interest.<sup>7,8,17</sup> We chose knowledge acquisition as the desired outcome in this study, as even those students who do not choose to practice Geriatric

Medicine, will likely encounter many older patients and will require some specialized knowledge in caring for the elderly patient

Limitations of previous published educational programs in Geriatric Medicine include lack of comparative pre- and post-testing. Other work has employed a different exam on pre- and post-testing<sup>12</sup> or compared students' performance to faculty members, fellows, or students in a different program.<sup>10</sup> We used students as their own controls, using the same questions pre- and post- rotation, to test core geriatric concepts.

The possibility of improved performance simply as a result of using the same questions twice must be considered. Therefore, we included additional questions on the post-exam to control for this possibility. It is unlikely that the significant improvement in scores is simply a result of repeat testing, as students tended to score better on the five additional questions that they had not seen before. Likewise, it is reassuring that there was

**Table 4. Mean Score and 95% Confidence Intervals on Repeated Questions and New Questions on the Post-rotation Exam**

Group	Number	Repeated Questions			New Questions		
		Mean	95% C.I.		Mean	95% C.I.	
			Lower	Upper		Lower	Upper
1	21	71.5	69.3	73.8	80.1	76.3	83.9
2	22	70.0	66.7	73.3	76.2	73.7	78.8
3	21	72.2	69.4	75.1	71.4	67.0	75.7
4	21	74.4	71.7	77.2	80.7	76.3	85.1

a significant improvement on all 15 questions, suggesting fairly broad learning of geriatric concepts.

Changing population demographics mandate not only the need for more specialists in geriatric medicine, but also that most, if not all, physicians should have an adequate knowledge of the principles of caring for older patients. This must be accomplished with a mandatory rotation in medical school, as only a minority of students will avail themselves of an elective experience in geriatric medicine.<sup>11</sup> We have demonstrated that a combined didactic and clinical program successfully increased students' knowledge in Geriatric Medicine. This program could be integrated into the curricula at other medical schools. Future research should address the issue of translating acquired knowledge in geriatric medicine into demonstrated clinical skills, when caring for the elderly.

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