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MD Undergraduate Curriculum Renewal

Integration Working Group: Interim Report

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Final Report

Working group Membership: Richard Cohen (Chair), Stan Bardal, Marjon Blouw, Cicely Bryce, Michael Davis, Majid Doroudi, Jason Ford, Blair Fulton, Kathy Gaul, Robin Hopkins, Michelle Oster, Glenn Regehr, Patrick Rowe, Brett Schrewe

Table of Contents

Executive Summary	3
Terms of Reference.....	7
Introduction	10
Methods.....	13
Re-visiting Integration.....	14
Clerkships.....	14
Cognitive integration (Integration from students' perspectives).....	15
Horizontal integration.....	19
Vertical integration	21
Longitudinal (Course) integration.....	23
Conclusion and Recommendations.....	26
References	29

Executive Summary

Mandate

The Integration working group was tasked with ‘breaking down barriers between blocks, subject areas and academic years in order to provide students with better learning opportunities and to encourage them to think about medical issues more comprehensively by integrating the human, social, and biological sciences with clinical principles.’

The working group was asked to develop a framework for integrating the curriculum across courses, disciplines and all four years and coordinating with the Curriculum Design working group to implement a curriculum where topics are revisited to allow progressive building of competencies and integration of existing and new knowledge and skills, to solve increasingly complex problems.

Methods

The group consulted with subject matter experts and incorporated recommendations from a previous curricular-renewal working group that focused on integration. It spent considerable time interpreting what was meant by integration in the UBC MD undergraduate curriculum, and how the working group could best effect integration in the curriculum. It began with an extensive literature search and an environmental scan of other medical schools (such as the University of Calgary clinical case presentation model).

Definitions

The Integration working group discussed the meaning of integration extensively and recommended that integration in the curriculum be viewed under three broad headings:

- 1) Logistic (administrative) integration: for example, facilitating the organization of a theme such as physiology within and across the curriculum
- 2) Cognitive integration: facilitating the acquisition, processing and utilization of knowledge by students in forms in which they will use it as clinicians
- 3) Affective integration: facilitating the integration of medical students’ identities, behaviors and attitudes with those of the *healthcare professions*

Recommendations

Based on the above definitions, the Integration working group recommends the following steps to facilitate curricular integration in the MDUP at UBC. Each recommendation has, either solely or in conjunction with another, significant implication for the changes required in the current MD Undergraduate Program to make it more integrative. Primarily however, integration as a process should be viewed from a student perspective both 1) cognitively, the manner in which students acquire, process and utilize knowledge in forms in which they will use it as clinicians and 2) affectively, the manner in which their identities, behaviors and attitudes are aligned with those of the *healthcare professions*.

To facilitate logistic integration:

1. There should be overall central control of curricular planning and implementation utilizing input from all the relevant departments in the medical school. Ultimate control of the curriculum should reside with the Associate Dean of Education and the Curriculum Committee, or another centralized body as recommended by the Governance working group.
2. Directors should be appointed for all the themes in the new curriculum. They should work in conjunction with the central planning committee.
3. A curriculum map should be utilized to ensure that there are no redundancies or inadvertent duplications of content in the curriculum. This map will also help implementation of a spiral curriculum (planned duplication of curricular content).
4. Professional clinician-educators should be utilized to guide students in small group learning sessions pertaining to clinical practice. This will promote continuity and help facilitate planned repetition (a spiral curriculum).

To facilitate cognitive integration:

1. Clinical experiences should start immediately and must guide the acquisition of biomedical knowledge, not vice-versa.
2. Educational technologies such as virtual patients should be used wherever use of real patients is not feasible, to realistically simulate clinical situations for learning purposes.
3. In order to facilitate meaningful early clinical exposure, course pre-requisites for admission should be re-examined. Students should be better prepared to understand the

medical curriculum from the outset, and, as an example, prerequisite courses in human physiology and biostatistics would be beneficial.

4. All educational activities, e.g. the content of courses such as clinical skills and DPAS which have previously been taught in isolation, should in future be taught in the context of patients and their problems. The future relevance of all this knowledge must be made clear to students.
5. Assessment provides a vital link in the cognitive integration chain.
 - a) Assessment should ultimately test problem-solving and decision-making abilities, rather than recall of factual knowledge.
 - b) Teaching and assessment strategies that require students to use both experiential and basic scientific knowledge to explain or rationalize diagnostic and therapeutic decisions should be utilized.
 - c) Pre-unit quizzes to promote review of related prior knowledge (knowledge to be built upon during a unit or block) should be utilized. In the examination at the end of each curricular unit, include some questions/tasks pertaining to content in the unit just completed and some questions/tasks integrating cumulated knowledge/skills from all units completed to date.
 - d) Regular formative examinations should be utilized to provide feedback and promote spaced assessment practice.
6. Consideration should be given to organizing the first two years of the curriculum by organ system blocks that have similar clinical presentations e.g. Blood & Lymphatics, CVS, Pulmonary and Renal; GI and Repro; MSK and Neurology. This will most realistically simulate the practice environment and help ensure that students learn to create anatomically broad differential diagnoses from the outset.
7. Move from reliance on PBL to other methods of small and large group teaching (using interactive lecturing techniques) such as case-based learning e.g. Harvard model of case-based learning and/or team-based learning. Consider whole patients and/or community health care as cases for group learning rather than focusing each case on an isolated biomedical 'problem'

To facilitate affective integration

1. Integrated clinical clerkships, or an equivalent longitudinal primary care experience, should be encouraged wherever possible for all students. Integrated clerkships, amongst other benefits, help facilitate inter-professionalism, which itself represents a form of affective integration.
2. Medical students might benefit from working experiences with practitioners in other healthcare professions, provided these attachments were guided by clear objectives.

Terms of Reference

The Integration working group has been mandated with the following tasks by the Implementation Task Force on Curriculum Renewal (ITFCR):

1. Recommend a process for mapping the curriculum from years 1 through 4.
2. Explore and identify opportunities for integration of curriculum in years 1 and 2, and look at vertical integration of basic sciences. Review integrated curricula at other medical schools and develop a long-term plan for integration. Obtain consensus on the degree of integration to be implemented.
3. Look at ways of eliminating silos, redundancies and inefficiencies in learning in the current curriculum and suggest areas where further integration can occur. Present findings to the Curriculum Design Working group.
4. Strategize and propose ways of integrating human, social and biological sciences to enable graduates to approach medical issues in an integrated and comprehensive manner.
5. There are a variety of ways in which integration might occur, (refer to page 77 of the DTFCR Report) and different approaches might be used in different parts of the curriculum. Propose pilots and projects that move the MD Undergraduate program towards ensuring that these approaches are implemented.
6. Develop a communication and engagement strategy to inform and collaborate with course directors, theme directors, block chairs, basic scientists, clinician and other stakeholders across courses, disciplines and years on integration of themes and curriculum.
7. Collaborate with the Assessment Working group to identify areas for integration of examination questions in the years 1 and 2.
8. Consider longitudinal integration, and plan and pilot a “Doctoring” Themes course with DPAS, Clinical Skills and FMED, which includes teaching core curriculum content with practical clinical experiences. Provide a means of assessing that basic sciences are learned in relevant and immediate contexts throughout all four years of the MD education experience.
9. Identify clinically relevant concepts that recur through the basic sciences and use these as an integrated focus for presentation, clinical examples and course materials.
10. Describe organizing principles that can be used for curriculum integration, e.g. organ systems, clinical presentations.

In addition to its tasks, the Integration working group took strategic direction from the following three sources:

1) The Dean's Task Force on Curricular Renewal (DTFCR)

The DTFCR recommended in its report,

“that the Faculty develop a curriculum based on integration of basic biomedical, clinical and other disciplines with increasing complexity across the entire period of study so that students concurrently acquire and use knowledge and skills from different disciplines in a manner consistent with real-life patient care, population health activities and research” (UBC Faculty of Medicine 73).

2) The Implementation Task Force for Curriculum Renewal (ITFCR)

As indicated in the Integration working group's terms of reference, the general expectation from the ITFCR is that,

“this implementation working group is responsible for breaking down barriers between blocks, subject areas and academic years in order to provide students with better learning opportunities and to encourage them to think about medical issues more comprehensively, integrating human, social, and biological sciences and clinical principles.

This group will develop the framework for integrating the curriculum across courses, disciplines and all 4 years and coordinate with the Curriculum Design working group to implement a curriculum where topics are revisited to allow progressive building of competence and integration of existing and new knowledge and skills, to solve increasingly complex problems” (Implementation Task Force for Curriculum Renewal).

3) The Future of Medical Education in Canada (FMED) Project

Recommendation III: Build on the Scientific Basis of Medicine stipulates that,

“Given that medicine is rooted in fundamental scientific principles, both human and biological sciences must be learned in relevant and immediate clinical contexts throughout the MD education experience. In addition, as scientific inquiry provides the basis for advancing health care, research interests and skills must be developed to foster a new generation of health researchers” (The Association of Faculties of Medicine of Canada 20).

Recommendation IV: Promote Prevention and Public Health states that,

“Promoting a healthy Canadian population requires a multifaceted approach that engages the full continuum of health and health care. Faculties of Medicine have a critical role to play in enabling this requirement and must therefore enhance the integration of prevention and public health competencies to a greater extent in the MD education curriculum” (Ibid. 21).

Introduction

Integration has multiple meanings in the context of medical education, and there is no single best way to define it in this regard. Perhaps the most useful definition is dictionary-derived: “to combine parts into a whole”. This ‘wholeness’ can then be conceived of in a number of more specific ways that are easier to form the basis of more usable perspectives.

Diagnostic and therapeutic decision-making, conventionally recognized as clinical expertise, are arguably the most important functions of the medical profession and represent the most valuable commodity that the profession offers society. The development of clinical expertise should therefore be at the core of the medical educational enterprise. This does not, however, negate the importance of the many other facets of the physician’s role.

There are at least two kinds of knowledge that physicians utilize in making their decisions: 1) factual, i.e. acquired externally from books, journals, lectures, etc.; and 2) experiential, i.e. acquired from their own clinical experiences, and which, in part, leads to the phenomenon of pattern recognition. It is not known how much factual knowledge is required to solve clinical problems or exactly what role this type of knowledge plays but any amount of factual knowledge alone is insufficient for solving clinical problems, and additional experiential knowledge is essential. Osler stated that, “it is astonishing with how little reading a doctor can practice medicine, but it is not astonishing how badly he may do it.” However, if he were alive today he might draw the opposite conclusion and comment on how much factual information medical students and residents are expected to know to pass their exams, but that possession of this knowledge alone does not automatically make them good practitioners.

Another way of conceptualizing the problem of factual versus experiential knowledge in medical education, is that, in the Flexnerian model, basic science or factual knowledge has always been seen as driving subsequent clinical problem solving and decision-making abilities. The problem with this way of doing things is that the exact role of the basic sciences in facilitating problem solving and decision-making is unknown. Therefore, it is not known how much basic science to teach. As a result, basic science is often over-taught, with predictable (and often negative) educational consequences. It might be more appropriate therefore to reverse the process, and let the clinical problem/presentation define the required knowledge base. This is in some ways similar to PBL, but only more structured.

From an educational perspective, therefore, it is crucial that medical students and residents master the ability to use factual and experiential knowledge in a seamless fashion to solve diagnostic and therapeutic problems. This, then, is one possible definition of integration in a medical educational sense. It is also apparent that the continued and artificial separation of

undergraduate medical training into pre-clinical and clinical phases is untenable, and the use of both factual and experiential knowledge is essential for the development of decision-making skills.

Vertical integration, conventionally defined as the integration of basic and clinical science teaching, represents one perspective. This is best exemplified by what experienced physicians do when seeing a patient for the first time. The process is initiated by the patient's presenting complaint(s), and they do not conventionally compartmentalize the process into one defined either by the recall of any specific piece of knowledge or by immediate association with any one organ system. It is a seamless transition from history to physical to the ordering of basic investigations (if necessary), followed by a differential diagnosis and then further refinement of diagnostic thinking, followed in turn by therapeutic decision-making. Vertical integration is primarily a cognitive phenomenon.

There are a number of other conceptions of integration in medical education, all of which are particularly relevant to the UBC MD Undergraduate Program (MDUP). The first of these is horizontal, which is essentially logistic in character, and denotes the ability of curriculum planners to coordinate teaching and learning appropriately. An example of this would be the coordinating of physiology teaching across multiple blocks in an organ-based curricular model. Secondly, there is the coordination of multiple, otherwise discreet, longitudinal courses such as Doctor, Patient and Society (DPAS) and Clinical and Communication Skills with the relevant FMED blocks. Thirdly, there are the integrated clerkships offered to a minority of third years students, and which offer a very useful perspective on patients and practice quite different from that obtained in the traditional discipline-based rotations. Finally, and most importantly, there is the concept of integration primarily as a student- and learner- rather than a faculty and curriculum- centered phenomenon. This view places both the cognitive integration of knowledge and the integration of students' behaviors and identities as professionals-in-training as the most important priority of undergraduate medical education.

The definitions of integration described above are not mutually exclusive, and perhaps the most useful way to think about integration in medical education is as a logistic, cognitive and affective process.

Integrated teaching in a broader sense does occur in a number of settings in the UBC MDUP. Examples of this include the problem-based learning process, the integrated clerkships and the teaching of clinical skills in temporal relationship to specific organ blocks in the Foundations of Medicine (FMED) curriculum. Conversely, lack of integration has been problematic in the UBC MDUP, and this has been highlighted particularly in recent external accreditation reports. Specifically, there is significant lack of integration with regard to much of the anatomy taught

independently of organ systems in the first semester of first year, the lack of coordinated planning of the FMED blocks as a whole and the specific disciplines (e.g. physiology) which run through the blocks, and DPAS, which often has little relevance to the organ-blocks with which it coincides. Most importantly, overall control of the curriculum, particularly in the first two years, has gradually diffused away from the Office of the Associate Dean of Education.

In summary, the working group felt it important that integration be viewed from three overarching perspectives:

- 1) Logistic/administrative; how courses are organized, planned and coordinated, particularly with regard to avoiding redundancy and silos and implementing planned repetition and reinforcement (a spiral curriculum).
- 2) Cognitive; how students acquire, process and use both factual and experiential knowledge to make diagnostic and therapeutic decisions.
- 3) Affective; how students' acquire professional attitudes, identities and behaviors which are aligned with all the healthcare professions.

Methods

The Integration working group was composed of clinicians, basic scientists, administrators, medical students, and representatives from the Evaluation Studies Unit (ESU) and Centre for Health Education Scholarship (CHES).

During its initial meetings, the group consulted with the original Integration working group report (established under the Dean's Task Force on Curriculum Renewal) and reviewed the findings from the MD Undergraduate Program retreats held in June 2009 and 2010.

It reviewed its terms of reference, and determined its scope. It spent considerable time interpreting what was meant by integration in the MD Undergraduate curriculum, and how the working group could best effect integration in the curriculum. It also conducted an extensive literature research and began an environmental scan of other medical schools (such as the University of Calgary clinical case presentation model). It will continue its and environmental scan.

In addition to its discussions, Glenn Regehr, Associate Director of the Centre for Health Education Scholarship presented to the working group on cognitive integration from students' viewpoints, which provide a valuable new insight on integrating the MD Undergraduate curriculum.

Writing responsibilities for the interim Integration working group report were shared amongst group members.

Re-visiting Integration

Throughout its discussions and consultation with individuals, reviews of the literature and other medical schools, the Integration working group distilled what was meant by integration and discussed integration in the current curriculum in the areas highlighted below.

Clerkships

The Integration Working group recognizes that examples of integration within the Year 3 clerkship experience are extant within the UBC FoM Undergraduate Program. Specifically, the Longitudinal Integrated Clerkship (LIC) experience has been successfully implemented in Chilliwack, Terrace, Fort St. John, and Duncan, with expansion planned into Vernon and Trail in September 2011. These models for clerkship integration, each with their own unique characteristics, have provided fodder for enthusiastic discussion as the Working group explored differences in the models. For example, Chilliwack (the original LIC within the UBC program) has an internal structure that is 'block-based,' mirroring a traditional clerkship, whereas Fort St. John offers a more free-form experience allowing students and preceptors to take advantage of experiences as they become available. A review of models at other Faculties of Medicine reveals Integrated Clerkships occurring in both urban and semi-urban settings, in isolation and alongside traditional clerkships, and at Flinders University as an amalgamated model whereby students experience a LIC for half of the year and a traditional clerkship for the other half.

The LIC experience at UBC and elsewhere demonstrates clear advantages. They provide the opportunity of offering a more continuous learning experience for students. There may be other ways of improving continuity for those not in LICs, which the Continuity Working group will explore. Furthermore, LICs allow learners to establish good relationships not only with the medical community in which they train, but also with their specific preceptors and their patients. Students become more visible to their preceptors. This visibility makes it easier to know where students are in their learning and also helps with integration of medical concepts in LICs. In addition, LICs help build inter-professional relationships as students speak to and interact with different health care practitioners (e.g. pharmacologists, nurses, etc.), in addition to experiencing a family practice clerkship.

Disadvantages of integrated clerkships have also been identified by the working group. Students within the LICs have preconceived fears; they worry that they are not getting a comparable educational experience and no exposure to sub-specialties when they are learning in an environment that does not have their preferred sub-specialty. However, UBC's data to date has suggested that students have been matched to their preferred areas during CARMS. Further, students tend to appreciate their experience after the clerkship rather than during it. Finally, the LICs represent a unique financial and logistical challenge. Administrative and governance approaches have developed as experience with LICs has accrued, and it is the

expectation that these issues will be discussed in more detail by the Curriculum Governance working group.

The working group has also discussed the traditional clerkship model and opportunities for other forms of integration. Most notable were discussions about vertical integration, which will be reviewed in the appropriate section. The possibility of integration within the context of Year 3's traditional clerkship has triggered preliminary discussions within the group, although no conclusions have yet been reached. Easing the barriers between the current discipline-based rotations is an exciting area of possibility, as is the promise of vertical, horizontal, cognitive, and longitudinal integration with the inevitable adjustments to the clerkship experience. Again, the discussions are preliminary but hold true potential.

In conclusion, the working group felt that integrated clerkships offer very significant potential for exciting development within the context of the overall clerkship experience in the UBC MDUP. Multiple models have been reviewed, and the Working group recognizes that there will likely be continuing diversity within the length and breadth of the UBC Faculty of Medicine Undergraduate clerkship experience. Logistic and governance issues notwithstanding, integration both within the clerkship and between the clerkship and other key elements of the Undergraduate program offers tremendous possibilities and opportunities to patients, students, faculty, and health care professionals from other disciplines and the curriculum.

Cognitive integration (Integration from students' perspectives)

Problematizing Integration

Regehr (2011) draws attention to a potential logical fallacy made by programs organizing medical curricula; specifically, if the program organizes the discrete components of its educational structure into a cohesive framework, students will therefore have an integrative learning experience. A curriculum can be structured from a faculty perspective in such a way to facilitate students' integration of its components. However curricular integration from the student perspective may be impeded by differing faculty and student perceptions regarding the objectives of undergraduate medical education.

Regehr suggests that while medical schools make tacit assumptions that students are partners in a framework enabling their professional evolution as physicians, many students instead understand medical school as a series of discreet tasks that need to be mastered on their way to becoming physicians. Optimally, integration succeeds when there is a balance between the program's goals for students and the expectations of that program by its students. Three key areas between students and faculty are noteworthy and merit further discussion: integration of knowledge (cognitive integration); understanding patient problems; and identity formation and development.

Cognitive Integration (the value of knowledge)

Regehr (2011) recognizes that how information goes in affects how it comes out. Patel (2009) provides an overview of several cognitive theories of learning:

Adaptive character of thought theory

Both skill (technique) and knowledge are required to undertake an action (such as a medical procedure). While the development of skill requires extensive repetition, preceding attainment of basic knowledge contextualizes the practice and contributes to understanding *why* the practice is best pursued in a certain way.

Cognitive load theory

Short-term memory is a limited space that can only accommodate a certain amount of information presented at any one time, suggesting that teachers need reflect upon the content of their lessons and focus carefully upon teaching only the most contextually relevant material.

Cognitive flexibility theory

This recognition of cognitive load becomes more important when one considers that learners develop “models of reality in their own minds” (i.e. new knowledge is organized in the brain based on previous knowledge/experience). Individuals with life histories and experiences peripheral to medical science exposure may have lower initial limits of how much information they can assimilate as compared to their colleagues who have developed a fluency in medical sciences due to a scientifically oriented undergraduate background.

In a review of educational theory, Tickle (2001) stratifies learning styles into three perspectives: *surface*, or a faithful reproduction of content motivated by a desire to pass; *deep*, a desire to understand the meaning of content influenced by marked interest in the learning material; and *achiever*, an integration of both surface and deep motivated by a desire to optimize exam performance. While educational performance from a deep perspective ostensibly is associated with better outcomes, one of its limitations is a lack of engagement by learners with material necessary to becoming a physician in which they are not deeply interested. In these situations, an achiever perspective demonstrates potential utility specifically in relation to the passing of exams.

Regehr (2011) also notes that knowledge integration depends heavily on the assessment system. Tests and exams convey subtly but powerfully to students what and how they should learn. For example, if one assesses basic sciences using only simple knowledge-based approaches during the first two years of medical school, students may not be able to utilize this knowledge for clinical reasoning during their clerkship years.

Reid et al (2007) further conceptualizes deep learning as an approach that seeks to understand, relates concepts to experience and examines the logic of an argument while using evidence critically. From a curricular design perspective, this approach is facilitated by: avoidance of factual overload; clear goals and informative feedback; clear, enthusiastic teaching focused on promoting conceptual change; freedom of choice over learning content and method; and assessment that rewards understanding through written work rather than multiple choice questions. This stance interdigitates well with Regehr's (2011) stance that one should consider potential gulfs between what students need to know to become a good clinician and their understanding of what it means to be a good doctor. This space is well characterized by Lingard's et al (2003) study on student case presentation; while clinical clerks perceived the gold standard of case presentation to be one free of interruptions; faculty understood the hallmark of good case presentation to be one that constructed shared knowledge for the attending team.

Interestingly, Reid et al (2007) did not find that introducing their suggestions increased the number of "deep learners." In response, they suggested that "it may be necessary to adopt more radical strategies for teaching and assessment than hitherto, in order to alter the students' perception sufficiently to change their approaches."

Integrative sense of the patient problem

In their preliminary assessment of the undergraduate curriculum, the Dean's Task Force on Curriculum Renewal working group on Integration recognized that,

"periodic integrative learning sessions and assessments in which patient problems are undifferentiated (applying accumulated knowledge and skills linked to different systems and competencies) might assist in promoting students' thinking outside the confines of individual body systems or a single competency theme... ideally these should become more complex as students advance through their training."

From a curricular content standpoint, Patel (2009) notes that "proponents of problem-based learning (PBL) have claimed that learning in context facilitates retrieval of knowledge, and thus most learning should be context-bound...However, although biomedical knowledge is indeed integrated into clinical problems in PBL situations, this integration is often so context-dependent that its transfer to other situations is difficult."

Regehr (2011) notes that how students conceptualize what the issues are with a particular patient is not necessarily mere integration of basic, clinical and social sciences applied to a specific encounter. Rather, one has to consider the processes through which a layperson

evolves to a person who thinks about patient problems. While the inculcation of the sciences are critical for this style of thinking, the engendering of a refined, nuanced and integrative sense of patients and their problems need take simultaneously into account the development of professional identity in which these sciences are embedded.

Integrative development of identity

Professional identity formation and the socialization processes through and by which it is constructed emerge as critical components of integration from a student perspective. Gee (2005) has conceptualized Discourse as a “way of combining and integrating language, actions, interactions, ways of thinking, believing, valuing, and using various symbols, tools, and objects to enact a particular sort of socially recognizable identity.” From this theoretical stance, it is evident that in physician training that there are many key components to be mastered. The CanMEDS competencies not only voice the mature inculcation of these roles, but additionally, as central constitutive guidelines in physician education, serve a prescriptive function, leading to a sense both of an “ideal” physician and of those who deviate from that ideal.

However, just as it is as self-evident that there are as many ways to be a physician in Canada as there are fellows of the Royal Colleges, it is worth noting that the same holds true for pre-qualification medical learners. While there is a degree of homology that allows medical students to recognize and be recognized as medical students *per se*, the explicit or formal component of the curriculum often contrasts with the informal or tacit ways in which it is often presented. Ultimately however each student will uniquely prioritize and integrate both these curricular components. Each will interact and participate uniquely with a curriculum and the faculty members, academic institutions, training landscapes and learning environments in which it is interwoven. While a curriculum may be seen as a uniform and static construction from a faculty standpoint, it is being actively integrated in a number of ways as myriad as the learners engaged with it. Finally, a reified conceptualization of a medical school class as “the students” detrimentally homogenizes inter-learner diversity and fails to recognize the variation of the members of this group.

How learners are conceptualized at a group level also may also, as Regehr (2011) suggests, erect a barrier towards professional identity formation. For example, a pre-medical training program is an adult learning situation. In contrast, when students arrive at medical school, they enter a lock-step system, where a schedule and course of study is pre-determined for them. As a result, learners regress from becoming adult learners and see themselves as students as opposed to burgeoning professionals. They then proceed to experience a sharp identity break from school to clinical training. There is thus utility in fostering an environment conducive to the

integration of identity as professional-in-training from the onset of medical school rather than relying upon discrete identities of student and *then* professional.

Conclusion

Regehr (2011) notes that there exists a tacit presumption that the integration of curriculum components will then lead seamlessly to the three aforementioned spheres of: cognitive integration; integrative sense of a patient's problem; and integration of professional identity. However, this is not necessarily the case, and an inability to problematize a potential gulf between the curriculum as it is developed by the faculty and the curriculum as it is collectively integrated by the student body and individually integrated by medical students may lead to a reproduction perpetuation – albeit with a different superficial appearance – of the original problem. Regehr (2011) further notes that – irrespective of the form a curriculum takes – learners will, by virtue of a need to make sense of their world, integrate their experience of it. How well this integration resonates with what the faculty purports to be important and necessary, however, remains a question of coherence and guidance by the faculty. The assessment system, in the subtle but powerful ways in which it socializes a learner through its prioritization of certain forms and content of medical knowledge, plays an underappreciated role in implicitly directing how a learner establishes a hierarchy of values in a classroom setting that may not interdigitate with those necessary for attentive, effective and empathetic patient care. One notes here a reproduction of the failure of the educational truism of “Do as I say, not as I do.”

Ostensibly, establishment of a framework for developing medical professionals able to care for the society in which they dwell remains one of the cardinal objectives of medical faculties. To paraphrase Satish Kumar: ‘patients are, therefore physicians are, and it remains incumbent upon a profession endowed with significant social autonomy to develop an integrated curriculum personally protective, academically rigorous, and empathetically-driven for the next generation of physicians serving society.’

Horizontal integration

The group first discussed the definition of horizontal (logistic/administrative) integration and how this definition applies to the UBC medical undergraduate curriculum. Horizontal integration was defined as integration of themes such as pathology, pharmacology, determinants of health, etc. across the four years of the MD Undergraduate Program (MDUP).

As depicted in the figure, an example of horizontal integration in the MD undergraduate curriculum is the teaching of physiology across various blocks in years 1 and 2 of PRIN/FMED.

It was agreed that horizontal integration is poorly done in the UBC MD Undergraduate Program.

A specific and clear example of poor horizontal integration is the lack of integration between PRIN and FMED. The lack of horizontal integration between PRIN and FMED, both courses that emphasize the basic sciences, leads to many lost opportunities to execute a ‘spiral’ curriculum, one that builds upon prior knowledge, increasing in complexity over time. Examples of where attempts have been made to integrate basic science concepts from PRIN and FMED include physiology of the kidney, which is covered in week 12 of PRIN and in the FERGU block of FMED. Leaders in these content areas and courses have made an effort to communicate with each other, even delivering content in each other’s blocks/weeks, in order to facilitate integration, and the spiral curriculum. Despite such efforts, students still appear to struggle to carry concepts learned from PRIN into FMED.

The group also discussed the implications of the loss of a course structure to horizontal integration. One specific example cited was pharmacology. Prior to the advent of the PBL curriculum in 1996, pharmacology was delivered in a course structure. The group was divided over whether a course structure more naturally facilitates horizontal integration, in the sense that course planners are: 1) more readily able to determine what has been taught previously, and 2) then able to execute the spiral curriculum, especially by ensuring continuity of lecturers.

Examples of effective horizontal integration in the UBC MDUP included anatomy and histology, both of which are currently treated as courses. However, it was also acknowledged that traditionally, a course- based structure is not conducive to longitudinal integration,. The discussion of horizontal integration also highlighted the fact that the various aspects of integration discussed by this group (vertical, longitudinal, etc.) must also be considered in an integrated manner. In other words, a discussion of horizontal integration should not be undertaken in isolation from a discussion of vertical integration. The group also acknowledged the need for the current governance structure of the MDUP to be stronger and more centralized in order to maintain the integrity of the spiral model.

	PRIN	CVS	Pulm	FERGU	GI	E & M
Anatomy						

Histology						
Physiology	X	X	X	X	X	X
Pathology						
Pharmacology						

Vertical integration

Vertical integration as defined by the working group brings together the basic and clinical sciences. The impetus for this type of integration results largely from the problematic Flexnerian divide between pre-clinical and clinical training. In addition, FMEC recommendation III states that “because medicine is rooted in fundamental scientific principles, both human and biological sciences **must** be learned in relevant and immediate clinical contexts throughout the MD education experience” (The Association of Faculties of Medicine of Canada 20). The FMEC report goes on to state that “these two complementary domains **must** be increasingly integrated so that students think about clinical applications as they learn basic sciences and about scientific principles as they learn clinical skills” (Ibid.). The concept of vertical integration has been unanimously accepted within the integration working group and to date the following recommendations with regards to vertical integration have been suggested:

- Basic sciences and clinical sciences should be better integrated. Students can better understand and retain the basic sciences when they see the relevance in a clinical context.
- Students should receive clinical exposure supported by basic science teaching from day one in medical school.
- Students should see clinical case presentations (real or virtual patients) at the outset of their medical education in order to teach students to make contextual decisions based on basic science knowledge as well as facilitate the transition into year 3.
- Sequencing of information presentation should be revisited to allow for improved vertical integration; the order of teaching should be reconsidered. Specifically some, but not all working group members felt that an appreciation of normal structure and function should precede study of the abnormal. Students should still however study normal and abnormal structure and function in a clinical context.
- Basic scientists should also participate in ward teaching.
- To break away from the Flexnerian model and to facilitate the transfer of knowledge between different clinical case presentations, virtual patient cases should not be rigidly divided into blocks. There is evidence to support that when students rotate piecemeal through subject matter, they learn better provided the subject matter is studied frequently enough.

- The words “clinicians” and “physicians” are often used interchangeably. Non-physician clinicians should also be integrated into the curriculum, and their work should also be acknowledged.
- Improve upon the integration that the program already has incorporated. Basic sciences are not taught in isolation in the current curriculum; they are already integrated with clinical medicine in Problem-Based Learning (PBL) as well as in Preparation for Medical Practice (PMP).

In addition to the above recommendations, two key factors were suggested to help enable vertical integration within the undergraduate curriculum:

- Faculty Development
 - Faculty development is critical to ensure that basic sciences are taught with clinical relevance.
 - Faculty recruitment and development strategies should be considered. Successful integration of basic and clinical sciences by students depends, in large part, on the lecturer or tutor.
- Communication between the basic science and clinical communities
 - Having a lecturer add a clinical problem into their lecture makes it more relevant clinically, but it does not make it integrative unless there is communication and cooperation between basic and clinical science educators.

Further questions and considerations that have been discussed by the working group include:

- Assessment
 - Knowledge integration depends heavily on the assessment system; tests and exams convey to students what and how they should learn. If one uses pure knowledge-based assessment tools for the basic sciences students may not be able to integrate this basic science knowledge into the clinical reasoning process.
- With regards to vertical integration, is the faculty meant to teach in the immediate context in which students will practice?

An issue continuing to provoke controversy within the Integration working group is the concept of sequencing with regard to foundational knowledge vs. practical experience, as well as the teaching of abnormal vs. normal structure/function. For example, some members held the perspective that the teaching/appreciation of normal anatomical structure and function should precede the abnormal. Alternatively some believe that although this approach may be cognitively appealing, it hadn't worked well in previous curricular formats and students should

be able to talk to a patient, do a physical examination, diagnose the problem, and then work backwards from the problem. Although the concept of vertical integration seems to support the latter viewpoint, there was some residual disagreement among members of the integration working group in this regard.

Integration of Longitudinal Courses

The report of the Integration working group from the Dean's Task Force on MD Undergraduate Curriculum Renewal included the statement that desired outcomes of graduates be "high level problem solving capabilities in new or complex situations, quality of care assurance and enhancement," and "creation of compassionate and ethical physicians with a strong sense of patient advocacy." The objectives of the longitudinal courses including DPAS 410, DPAS 420, Clinical Skills and Family Practice contribute to these outcomes.

Statement of the problem

The report identified that currently there is variation in the delivery of the longitudinal courses with "degrees of concordance at any given point" and that without concordance the students "felt disjointed". A disjointed delivery may not assist in integrating knowledge, patient problems or professional identity. In addition, it was discussed during the current Integration working group meetings that "students are not as engaged in our DPAS curriculum as they are with other aspects of their learning ... Integration of psychosocial aspects of clinical care needs to be done in a more meaningful and relevant way in order to produce the doctors our society needs and wants" (Integration Working Group minutes January 2011). How can one "enable the student to integrate the delivered content rather than (just) integrating the delivery" (Ibid.) when teaching "beyond the biophysical, about people and the societal context of medicine?" (Ibid).

Themes and outcomes

The themes from the Dean's Task Force, the CanMEDS competencies, clinical sciences themes and objectives of the current courses that particularly fit into integrated longitudinal courses include, prevention, epidemiology and population health, research principles and evidence-based medicine, diagnostic and therapeutic reasoning, patient safety, professionalism and ethics, the law as it relates to medicine, social accountability, management principles, health care system dynamics and patient advocacy, inter-professional collaboration skills, communication, including patient education and shared decision making and finally physician self-care. These are core requirements in an undergraduate curriculum regardless of career path and these longitudinal courses should help graduates integrate "an appropriate

professional identity"... into their personal identities... while being integrated into the profession" (Integration Working Group minutes September 2010).

Literature review

Additional consideration of literature, specific to integrating clinical skills, doctor patient and society and family practice was not identified beyond general concepts identified in the included in the bibliography. Principles of the early use of cases and clinical material and vertical and horizon integration themes apply to these longitudinal courses.

What are we going to have to do?

The statements below are a compilation of ideas. The amount of time in the meetings did not allow the group to come to a consensus on them all.

- The courses should run through all year 4 years i.e.: be integrated into the clerkship. This would assist in a smoother transition to years 3 and 4. In addition it would help in the "integration of identity."
- Students should begin to see cases at the outset of their medical education and organize their learning around clinical case presentation.
- Therapeutic decision making should be progressive
- Clinical skills teaching can be integrated into the cases
- Societal aspects should also be integrated into the cases
- History and physical examination should be taught in the context of clinical problems.
- Reorient the clinical skills towards preparing to be a clerk not preparing to be a physician
- As integration is a methodology the program should provide students with a theoretical/practical framework to deal with patients that they can operationalize
- Share course information between course directors
- Consider a course auditor that gives a quality review of the course
- Consider integrating the DPAS lectures into the FMED Content
- Assessment needs to be reconsidered in a more integrative fashion
- Students are motivated to learn professionalism regardless and role modeling is currently a strong instructional methodology which should be understood (implications for type and quality of educators)

The group did not discuss whether the courses should be completely rolled into one course, led by one team or whether the individual courses should be retained and be integrated through a collaborative discussion of content and pedagogy between course directors and managers. In either situation the governance of the course/s will be important. In addition assessment of the

students will require relevant formative and summative methodologies in the context of a complex health care decision-making process.

Conclusion and Recommendations

Based on the above definitions, the Integration working group recommends the following steps to facilitate curricular integration in the MDUP at UBC. Each recommendation has, either solely or in conjunction with another, significant implication for the changes required in the current MD Undergraduate Program to make it more integrative. Primarily however, integration as a process should be viewed from a student perspective both 1) cognitively, the manner in which students acquire, process and utilize knowledge in forms in which they will use it as clinicians and 2) affectively, the manner in which their identities, behaviors and attitudes are aligned with those of the *healthcare professions*.

1. There should be overall central control of curricular planning and implementation utilizing input from all the relevant departments in the medical school. Ultimate control of the curriculum should reside with the Associate Dean of Education and the Curriculum Committee, or another centralized body as recommended by the Governance working group.
2. Directors should be appointed for all the themes in the new curriculum. They should work in conjunction with the central planning committee.
3. A curriculum map should be utilized to ensure that there are no redundancies or inadvertent duplications of content in the curriculum. This map will also help implementation of a spiral curriculum (planned duplication of curricular content).
4. Professional clinician-educators should be utilized to guide students in small group learning sessions pertaining to clinical practice. This will promote continuity and help facilitate planned repetition (a spiral curriculum).
5. Clinical experiences should start immediately and must guide the acquisition of biomedical knowledge, not vice-versa.
6. Educational technologies such as virtual patients should be used wherever use of real patients is not feasible, to realistically simulate clinical situations for learning purposes.
7. In order to facilitate meaningful early clinical exposure, course pre-requisites for admission should be re-examined. Students should be better prepared to understand the

medical curriculum from the outset, and, as an example, prerequisite courses in human physiology and biostatistics would be beneficial.

8. All educational activities, e.g. the content of courses such as clinical skills and DPAS which have previously been taught in isolation, should in future be taught in the context of patients and their problems. The future relevance of all this knowledge must be made clear to students.
9. Assessment provides a vital link in the cognitive integration chain.
 - a. Assessment should ultimately test problem-solving and decision-making abilities, rather than recall of factual knowledge.
 - b. Teaching and assessment strategies that require students to use both experiential and basic scientific knowledge to explain or rationalize diagnostic and therapeutic decisions should be utilized.
 - c. Pre-unit quizzes to promote review of related prior knowledge (knowledge to be built upon during a unit or block) should be utilized. In the examination at the end of each curricular unit, include some questions/tasks pertaining to content in the unit just completed and some questions/tasks integrating cumulated knowledge/skills from all units completed to date.
 - d. Regular formative examinations should be utilized to provide feedback and promote spaced assessment practice.
10. Consideration should be given to organizing the first two years of the curriculum by organ system blocks that have similar clinical presentations e.g. Blood & Lymphatics, CVS, Pulmonary and Renal; GI and Repro; MSK and Neurology. This will most realistically simulate the practice environment and help ensure that students learn to create anatomically broad differential diagnoses from the outset.
11. Move from reliance on PBL to other methods of small and large group teaching (using interactive lecturing techniques) such as case-based learning e.g. Harvard model of case-based learning and/or team-based learning. Consider whole patients and/or community health care as cases for group learning rather than focusing each case on an isolated biomedical 'problem'

12. Integrated clinical clerkships, or an equivalent longitudinal primary care experience, should be encouraged wherever possible for all students. Integrated clerkships, amongst other benefits, help facilitate inter-professionalism, which itself represents a form of affective integration.
13. Medical students might benefit from working experiences with practitioners in other healthcare professions, provided these attachments were guided by clear objectives.

References

- "Integration." Def. n. *The Canadian Oxford Dictionary*. Canada: Oxford University Press, 1998.
A Collective Visions for MD Education. Ottawa: 2010.
- Balasoorya, C. D., C. Hughes, et al. (2009). "Impact of a new integrated medicine program on students' approaches to learning." Higher Education Research & Development 28(3): 289 - 302.
- Bergman, E. M., C. P. M. Van Der Vleuten, et al. (2011). "Why don't they know enough about anatomy? A narrative review." Medical Teacher 33(5): 403-409.
- Bierer, S. B., C. A. Taylor, et al. (2009). "Evaluation of Essay Questions Used to Assess Medical Students' Application and Integration of Basic and Clinical Science Knowledge." Teaching and Learning in Medicine: An International Journal 21(4): 344 - 350.
- Bleakley, A. (2009). "Curriculum as conversation." Adv Health Sci Educ Theory Pract 14(3): 297-301.
- Bleakley, A., R. Marshall, et al. (2006). "Toward an aesthetic medicine: developing a core medical humanities undergraduate curriculum." J Med Humanit 27(4): 197-213.
- Bloom, S. W. (1988). "Structure and ideology in medical education: an analysis of resistance to change." Journal of Health and Social Behavior 29(4): 294-306.
- Boudreau, J. D. and E. J. Cassell (2010). "Abraham Flexner's "Mooted Question" and the Story of Integration." Academic Medicine 85(2): 378-383
- Boudreau, J. D., E. Cassell, et al. (2007). "A healing curriculum." Medical Education 41(12): 1193-1201.
- Bowe, C. M., J. Voss, et al. (2009). "Case method teaching: An effective approach to integrate the basic and clinical sciences in the preclinical medical curriculum." Medical Teacher 31(9): 834-841.
- Brynhildsen, J., L. O. Dahle, et al. (2002). "Attitudes among students and teachers on vertical integration between clinical medicine and basic science within a problem-based undergraduate medical curriculum." Medical Teacher 24(3): 286-288.
- Couper, J., PS Worley, et al. (2011). "Rural longitudinal integrated clerkships: lessons from two programs on different continents." Rural Remote Health. 11:1665.
- Cox, M., D. M. Irby, et al. (2006). "American Medical Education 100 Years after the Flexner Report." New England Journal of Medicine 355(13): 1339-1344.
- Dahle, L. O., J. Brynhildsen, et al. (2002). "Pros and cons of vertical integration between clinical medicine and basic science within a problem-based undergraduate medical curriculum: examples and experiences from Linköping, Sweden." Medical Teacher 24(3): 280-285.
- Dean's Task Force on MD Undergraduate Curriculum Renewal Report of Working group 3: Curriculum Integration Revised 2009.12.22

Dornan, T. and C. Bundy (2004). "What can experience add to early medical education? Consensus survey." British Medical Journal **329**(7470): 834-837.

Frank, JR., Jabbour, M., et al. Eds. Report of the CanMEDS Phase IV Working groups. Ottawa: The Royal College of Physicians and Surgeons of Canada, 2005.

Gee, J.P. (2005). *An introduction to discourse analysis, 2nd ed.* London: Routledge.

Gordon, J. A., E. M. Hayden, et al. (2010). "Early Bedside Care During Preclinical Medical Education: Can Technology-Enhanced Patient Simulation Advance the Flexnerian Ideal?" Academic Medicine **85**(2): 370-377.

Harden, R. M. (2000). "The integration ladder: a tool for curriculum planning and evaluation." Medical Education **34**(7): 551-557.

Harden, R. M., S. Sowden, et al. (1984). "Educational strategies in curriculum development: the SPICES model." Medical Education **18**(4): 284-297.

Harden, R.M., J. Crosby, et al. (2000). "Task-based learning: the answer to integration and problem-based learning in the clinical years." Medical Education **34**(5): 391- 397.

Implementation Task Force for Curriculum Renewal. Integration Working group Terms of Reference.

Integration working group minutes. January 19, 2011.

Integration working group minutes. September 16, 2011.

Irby, D. M., M. Cooke, et al. (2010). "Calls for Reform of Medical Education by the Carnegie Foundation for the Advancement of Teaching: 1910 and 2010. [Article]." Academic Medicine **85**(2): 220-227.

Jacobson, S., S. K. Epstein, et al. (2009). "Creation of virtual patients from CT images of cadavers to enhance integration of clinical and basic science student learning in anatomy." Medical Teacher **31**(8): 749 - 751.

Kitzes, J.A., R.D Savich, et al. (2007). "Fitting it all in: integration of 12 cross-cutting themes into a School of Medicine curriculum." Medical Teacher **29**(5):489 - 494.

Klement, B. J., D. F. Paulsen, et al. (2011). "Anatomy as the backbone of an integrated first year medical curriculum: Design and implementation." Anatomical Sciences Education **4**(3): 157 – 169.

Lingard, L., Schryer, C., Garwood, K., & Spafford, M. (2003). 'Talking the talk': School and workplace genre tension in clerkship case presentations. *Med Educ* **37**, 612-620.

Malik, A. S. and R. H. Malik (2011). "Twelve tips for developing an integrated curriculum." Medical Teacher **33**(2): 99-104.

McGrath, B. P., I. S. Graham, et al. (2006). "Lack of integration of medical education in Australia: the need for change." Medical Journal of Australia **184**(7): 346-348.

Mennin, S. (2010). "Complexity and health professions education." Journal of Evaluation in Clinical Practice **16**(4): 835-837.

Mennin, S. (2010). "Self-organisation, integration and curriculum in the complex world of medical education." Medical Education. **44**(1): 20 - 30.

Muller, J. H., S. Jain, et al. (2008). "Lessons learned about integrating a medical school curriculum: perceptions of students, faculty and curriculum leaders." Medical Education **42**(8): 778-785.

Neville, A. (2009). "National Literature Reviews." AFMC-Medical Education in Canada: A Review of Undergraduate Medical Curricula. Retrieved Novemer, 2010, from <http://www.afmc.ca/fmec/activities-env-literature.php>.

Ogur, B., D. Hirsh, et al. (2007). "The Harvard Medical School-Cambridge integrated clerkship: an innovative model of clinical education." Academic Medicine. **82**(4): 397 - 404.

Osler, William. (1901). *Dedication address*. Boston Medical Library Books and Men.

Papa, F. J. and P. H. Harasym (1999). "Medical curriculum reform in North America, 1765 to the present: a cognitive science perspective." Academic Medicine **74**(2): 154-164.

Patel, V.L., Yoskowitz, N.A., & Arocha J.F. (2009). Towards effective evaluation and reform in medical education: a cognitive and learning sciences perspective. *Adv Health Sci Educ* **14**/5, 791-812.

Poncelet, A., S. Bokser, et al. (2011). "Development of a longitudinal integrated clerkship at an academic medical center." Medical Education Online. doi: 10.3402/meo.v16i0.5939.

Regehr, G. (2011). Address to UBC Integration Working group, 19 January 2011.

Reid, W.A., Duvall, E., & Evans, P. (2007). Relationship between assessment results and approaches to learning and studying in Year Two medical student. *Med Educ* **41**, 8.

Ruiz, J. G., M. J. Mintzer, et al. (2006). "The Impact of E-Learning in Medical Education." Academic Medicine **81**(3): 207-212.

Spencer, A. L., T. Brosenitsch, et al. (2008). "Back to the Basic Sciences: An Innovative Approach to Teaching Senior Medical Students How Best to Integrate Basic Science and Clinical Medicine." Academic Medicine **83**(7): 662-669.

The Association of Faculties of Medicine of Canada. *The Future of Medical Education in Canada (FMEC)*:

Tickle, S. (2001). What have we learnt about student learning: A review of the research on study approach and style, *Kybernetes* **30**, 7/8, 955.

UBC Faculty of Medicine. *Dean's Task Force on Curriculum Renewal: Final Report*. Vancouver: 2010.

UBC Faculty of Medicine. One Year Integrated Clerkship. Retrieved from http://www.med.ubc.ca/education/md_ugrad/Curriculum__Educational_Programs/One_Year_Integrated_Clerkship.htm.

Van der Veken, J., M. Valcke, et al. (2009). "Impact of the transition from a conventional to an integrated contextual medical curriculum on students' learning patterns: a longitudinal study." Medical Teacher **31**(5): 433 - 441.

Vidic, B. and H. M. Weitlauf (2002). "Horizontal and vertical integration of academic disciplines in the medical school curriculum." Clinical Anatomy **15**(3): 233-235.

Weatherall, D. (2011). "Science and medical education: is it time to revisit Flexner?" Medical Education **45**(1): 44-50.

Wijnen-Meijer, M., O. T. J. ten Cate, et al. (2010). "Vertical integration in medical school: effect on the transition to postgraduate training." Medical Education **44**(3): 272-279.

Wilkerson, L., C. M. Stevens, et al. (2009). "No content without context: Integrating basic, clinical, and social sciences in a pre-clerkship curriculum." Medical Teacher **31**(9): 812-821.

Wylie, A. (2010). Vocational curricula: structures and demands. Health Promotion in Medical Education: From Rhetoric to Action. A. Wylie and T. Holt. Abingdon, Radcliffe Publishing Ltd: 53-65.