The Health Impacts of Pre-Service Education: An Integrative Review and Evidence-Based Conceptual Model
Jhpiego is an international, non-profit health organization affiliated with The Johns Hopkins University. For nearly 40 years, Jhpiego has empowered frontline health workers by designing and implementing effective, low-cost, hands-on solutions to strengthen the delivery of health care services for women and their families. By putting evidence-based health innovations into everyday practice, Jhpiego works to break down barriers to high-quality health care for the world’s most vulnerable populations.

Published by:
Jhpiego Corporation
Brown’s Wharf
1615 Thames Street
Baltimore, Maryland 21231-3492, USA
www.jhpiego.org

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September 2012

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# Table of Contents

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>BOXES, FIGURES, AND TABLES</td>
<td>v</td>
</tr>
<tr>
<td>ABBREVIATIONS AND ACRONYMS</td>
<td>vi</td>
</tr>
<tr>
<td>ACKNOWLEDGMENT AND DISCLAIMER</td>
<td>vii</td>
</tr>
<tr>
<td>EXECUTIVE SUMMARY</td>
<td>1</td>
</tr>
<tr>
<td>1. Background</td>
<td>1</td>
</tr>
<tr>
<td>2. Purpose</td>
<td>1</td>
</tr>
<tr>
<td>3. Methods</td>
<td>1</td>
</tr>
<tr>
<td>4. Findings</td>
<td>2</td>
</tr>
<tr>
<td>5. Conclusion</td>
<td>5</td>
</tr>
<tr>
<td>INTRODUCTION AND BACKGROUND</td>
<td>6</td>
</tr>
<tr>
<td>1. Background</td>
<td>6</td>
</tr>
<tr>
<td>2. Purpose and Objectives</td>
<td>7</td>
</tr>
<tr>
<td>METHODS</td>
<td>8</td>
</tr>
<tr>
<td>1. Developing a Core and Collaborating Team</td>
<td>8</td>
</tr>
<tr>
<td>2. Envisioning the Model</td>
<td>8</td>
</tr>
<tr>
<td>3. Developing a Glossary</td>
<td>10</td>
</tr>
<tr>
<td>4. Literature Review</td>
<td>10</td>
</tr>
<tr>
<td>5. Developing a System for Categorizing the Literature</td>
<td>11</td>
</tr>
<tr>
<td>6. Retrieving Articles and Extracting Data</td>
<td>13</td>
</tr>
<tr>
<td>RESULTS</td>
<td>15</td>
</tr>
<tr>
<td>DIRECT INFLUENCES</td>
<td>15</td>
</tr>
<tr>
<td>1. Students</td>
<td>15</td>
</tr>
<tr>
<td>2. Curriculum</td>
<td>16</td>
</tr>
<tr>
<td>3. Teachers/Tutors/Preceptors</td>
<td>19</td>
</tr>
<tr>
<td>4. Infrastructure and Management</td>
<td>23</td>
</tr>
<tr>
<td>5. Clinical Practice Sites</td>
<td>26</td>
</tr>
<tr>
<td>INFLUENCING FACTORS</td>
<td>28</td>
</tr>
<tr>
<td>1. Regulation</td>
<td>29</td>
</tr>
<tr>
<td>2. The Context of Health Service Delivery</td>
<td>29</td>
</tr>
<tr>
<td>OUTCOMES AND IMPACT</td>
<td>30</td>
</tr>
<tr>
<td>1. Performance Outcomes</td>
<td>30</td>
</tr>
<tr>
<td>2. Community Outcomes</td>
<td>31</td>
</tr>
<tr>
<td>3. Health and Health Systems Impact</td>
<td>32</td>
</tr>
<tr>
<td>DISCUSSION</td>
<td>33</td>
</tr>
<tr>
<td>1. Limitations of This Study</td>
<td>33</td>
</tr>
<tr>
<td>2. Commentary</td>
<td>33</td>
</tr>
<tr>
<td>CONCLUSION</td>
<td>39</td>
</tr>
</tbody>
</table>
Boxes, Figures, and Tables

BOXES
Box 1: Competency Definitions .................................................................................................................. 6
Box 2: MeSH and Key Search Terms .......................................................................................................... 11
Box 3: Methodological Definitions ............................................................................................................. 12

FIGURES
Figure 1: Conceptual Model: The Health Impacts of Pre-Service Education ............................................. 10
Figure 2: Inclusion Process ......................................................................................................................... 14

TABLES
Table 1: Educational Standards: Domains Cited by Three Major Professional Organizations ............... 8
Table 2: Grading Criteria ............................................................................................................................. 12
Table 3: Effects of Training: Kirkpatrick’s Levels of Training Evaluation (adapted*) ............................... 13
### Abbreviations and Acronyms

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>BEME</strong></td>
<td>Best Evidence in Medical Education</td>
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<tr>
<td><strong>CBE</strong></td>
<td>Competency-based education</td>
</tr>
<tr>
<td><strong>CE</strong></td>
<td>Continuing education</td>
</tr>
<tr>
<td><strong>CI</strong></td>
<td>Confidence interval</td>
</tr>
<tr>
<td><strong>CINAHL</strong></td>
<td>Cumulative Index to Nursing and Allied Health Literature</td>
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<tr>
<td><strong>CPE</strong></td>
<td>Continuing professional education</td>
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<tr>
<td><strong>DN</strong></td>
<td>District nurse</td>
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<tr>
<td><strong>EBP</strong></td>
<td>Evidence-based practice</td>
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<tr>
<td><strong>EPA</strong></td>
<td>Entrustable professional activity</td>
</tr>
<tr>
<td><strong>ES</strong></td>
<td>Effect size</td>
</tr>
<tr>
<td><strong>GPA</strong></td>
<td>Grade point average</td>
</tr>
<tr>
<td><strong>HOP</strong></td>
<td>Health occupation or profession</td>
</tr>
<tr>
<td><strong>HR</strong></td>
<td>Human resources</td>
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<tr>
<td><strong>ICM</strong></td>
<td>International Confederation of Midwives</td>
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<tr>
<td><strong>ICN</strong></td>
<td>International Council of Nurses</td>
</tr>
<tr>
<td><strong>IPE</strong></td>
<td>Inter-professional education</td>
</tr>
<tr>
<td><strong>LMIC</strong></td>
<td>Low/middle-income countries</td>
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<tr>
<td><strong>MCAT</strong></td>
<td>Medical College Admission Test</td>
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<tr>
<td><strong>MCHIP</strong></td>
<td>Maternal and Child Health Integrated Program</td>
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<tr>
<td><strong>MeSH</strong></td>
<td>Medical subject headings</td>
</tr>
<tr>
<td><strong>MNCH</strong></td>
<td>Maternal, neonatal, and child health</td>
</tr>
<tr>
<td><strong>MUA</strong></td>
<td>Medically underserved area</td>
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<tr>
<td><strong>MVA</strong></td>
<td>Manual vacuum aspiration</td>
</tr>
<tr>
<td><strong>NCLEX-RN</strong></td>
<td>National Council Licensure Examination–Registered Nurse</td>
</tr>
<tr>
<td><strong>OR</strong></td>
<td>Odds ratio</td>
</tr>
<tr>
<td><strong>OSCE</strong></td>
<td>Objective structured clinical examination</td>
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<tr>
<td><strong>PBL</strong></td>
<td>Problem-based learning</td>
</tr>
<tr>
<td><strong>PSE</strong></td>
<td>Pre-service education</td>
</tr>
<tr>
<td><strong>QI</strong></td>
<td>Quality improvement</td>
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<tr>
<td><strong>RCT</strong></td>
<td>Randomized controlled trial</td>
</tr>
<tr>
<td><strong>SDL</strong></td>
<td>Self-directed learning</td>
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<tr>
<td><strong>SMD</strong></td>
<td>Standardized mean difference</td>
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<tr>
<td><strong>SORT</strong></td>
<td>Strength of Recommendation Taxonomy</td>
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<tr>
<td><strong>UK</strong></td>
<td>United Kingdom</td>
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<tr>
<td><strong>USAID</strong></td>
<td>United States Agency for International Development</td>
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<tr>
<td><strong>USMLE</strong></td>
<td>United States Medical Licensing Examination</td>
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<tr>
<td><strong>WFME</strong></td>
<td>World Federation for Medical Education</td>
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<td><strong>WHO</strong></td>
<td>World Health Organization</td>
</tr>
</tbody>
</table>
Acknowledgment and Disclaimer

The authors gratefully acknowledge the contributions to the work made by members of the Jhpiego Concept Analysis Collaborating Group: Linda Bartlett, PhD; Catherine Carr, DrPH; Amnesty LeFevre, PhD; Luc de Bernis, MD; Carey McCarthy, MPH; Lois Schaefer, MPH; Jeffrey Smith, MD; Udaya Thomas, MSN, MPH; and Tegbar Yigzaw, MD.

We thank the Jhpiego publications office staff members for their assistance with development of graphics for this report.
Executive Summary

Background

Jhpiego is a recognized leader in health occupational, professional, and community health worker education and training. For nearly 40 years, Jhpiego has implemented more than 120 professional worker education programs in more than 35 countries. The enhancement of knowledge and the development of competency-based skills needed for optimal job performance characterize Jhpiego’s approach to pre-service education (PSE) and training programs focused on sustaining the continuing competency of the health care workforce. Jhpiego’s pre-service educational programming has the ultimate goal of advancing health equity both within and between countries, in the best interests of health workers, country governments, and the populations served.

Purpose

This integrative review of the literature was undertaken to examine what is presently known about the various factors that influence the quality of PSE programs. This literature synthesis underpins a conceptual model of PSE that offers a visual depiction of the proposed relationships between factors (inputs and processes) that lead to a hypothesized desired outcome.

The purpose of the model is to describe the logical links between inputs (e.g., activities, resources) that can strengthen health occupation or profession (HOP) PSE systems, and the ultimate public health impact. The model should enable Jhpiego to articulate the components of good PSE programming to the global community of educators in the health field, and to the policymaking bodies at global and country levels. Defining the components of good PSE programming can help stakeholders prioritize their investments (i.e., articulate clearly the ways in which high-quality PSE can inform program development).

Methods

The peer-reviewed literature cited in multiple electronic databases was searched between January and March of 2011. The titles of various cadres of providers served as primary medical subject headings and key search terms. These cadres represent the several HOPs that have been the primary recipients of Jhpiego PSE efforts. Subcategories were selected to include a variety of specialties in which the health workers might be additionally prepared. Various combinations of secondary search terms were used in iterative literature searches. These secondary terms included education, evaluation, and credentialing terms as well as aspects of the intended outcomes of PSE.

A categorization scheme was developed to reflect the various types of literature retrieved for the integrative review of PSE. Tier 1 and Tier 2 grading was assigned to studies that employed higher-order experimental research designs. Tier 3 literature was included, where necessary, to address specific topics of interest—topics for which experimental studies could not be identified, or were not appropriate. In addition, grading according to Kirkpatrick’s four-level model of training evaluation (as adapted for use in Best Evidence in Medical Education reviews) was applied to each study to affirm that the studies selected in this review addressed the broader spectrum of PSE process and outcome.

Over 6,000 articles were retrieved from searches limited to the years 2000–2011, from which 1,742 articles were retained, after review of title and abstract. Specifically deleted from consideration were articles that: reported experiences that were unlikely to have wide generalizable application, that were very narrow in focus, and that reported very limited sample sizes. Articles that reported on post-graduate training events (continuing professional education and in-service education) were excluded from the PSE review. Opinion
pieces, editorials, commentaries, and project reports (gray literature) were also excluded. In total, 124 articles were retained. A hand-search of other bibliographies relevant to the topic yielded an additional 14 studies.

These studies were then graded, generating a total of 52 articles. Two supplementary searches were conducted to focus on specific topics of interest that were not well represented by these studies. In total, 45 articles were added. This generated a total of 97 articles that were finally entered into consideration, of which N = 31 were graded as Tier 1, N = 15 as Tier 2, and N = 51 as Tier 3.

Findings
The literature contained a very rich discussion of elements that contribute to quality PSE. However, the discussion of proven linkages between PSE and quality health care service delivery—which are the intended outcomes of competency-based education—was not well developed.

Students
Student selection criteria that predict academic and clinical success include higher academic performance in secondary school studies; however, older age (post-secondary school) and gender did not contribute to either academic performance or student retention. Rural residence at the time of application is strongly linked to post-graduate selection of rural settings as the site of practice. Student support strategies (e.g., financial support, mentoring) offered some advantage to student retention, and contributed particularly to diversifying the student profile.

Curriculum
The term competency-based education is used throughout contemporary PSE literature. A competency-based curriculum (i.e., a set of teaching, learning, and assessment activities that are intended to enable students to acquire and demonstrate a predetermined set of knowledge, skills, and behaviors as the outcome of learning) is a foundational component. The competency-based education approach has been indirectly evaluated through assessment of various strategies used to implement the competency-based curriculum, which is a basic component of competency-based education. Problem-based learning (PBL) is a recent approach to competency-based curriculum design. Studies that compare PBL to traditional curricula do not provide incontrovertible evidence to favor the PBL design over any other, but also do not dispute the design as a strategy within competency-based learning.

No contemporary studies were identified that compared the graduates educated within technical (leading to a certificate of completion) or academic (culminating in at least a baccalaureate degree) programs of study in terms of competence in the workplace. So, findings from this integrative review could not enlighten the (technical versus academic) policy debate.

A good deal of progress has been made in developing valid and reliable tools for the formative and summative assessment of students. These tools can be used to promote and ensure competence at the time of program completion. The objective structured clinical examination (OSCE) is of particular value, although developers of newly constructed OSCEs must take particular care to examine the psychometric properties of these tools.

Regulatory authorities, policymaking bodies, and professional associations all have a role in aligning the PSE curriculum with the scope of practice required upon graduation and deployment. In many countries the need to prepare students for primary care practice in lower-resourced, rural, and remote settings is an issue of critical importance. A number of reports indicate that this issue has to be addressed even prior to admission to the program of studies, noting that student recruitment and admission incentives have much to do with future intentions and actions following graduation. Additionally, clinical placement in rural areas has
demonstrated some effect on changing perceptions, attitudes, and values about working in a lesser-resourced environment.

**Teachers/Tutors/Preceptors**
The effective development of competency depends upon initially preparing—and then retaining—skillful teachers/tutors. Few studies were available to confirm a requirement that the teacher/tutor of a health professional discipline be equally skilled as both classroom teacher/tutor and clinical preceptor (an individual who guides/teaches/models learning for one or more students in the clinical setting). These roles include the responsibility to assist with individual student learning needs, to translate components of the academic curriculum into the clinical setting, and to help students make the important link between theory and practice. The literature, however, amply describes and discusses the importance of these roles as complements to the role of the academic educator.

The literature also supports the premise that administrative leaders in both the academic and clinical settings must be strongly supportive of their mutual roles and responsibilities. Academic administrators must be cognizant of the impact on the provision of client care that is created when clinical teachers/tutors must attend, simultaneously, to the physical, emotional, and learning needs of patients and student learners. Facility administrators must appreciate the added value that students bring to the clinical setting because their presence encourages facility providers (staff and preceptors) to update, on a continuous basis, the science that underpins their clinical practice.

**Infrastructure and Management**
Extensive experience leads to the understanding of the broad variety of elements, within the physical environment, that are essential to promote student learning and skills acquisition; however, the literature is very underdeveloped in this domain.

Several systematic reviews explore the effectiveness of single educational techniques and approaches that can be introduced as elements of the infrastructure. Internet-based learning has been extensively studied. Several meta-analyses indicate that this distance-education modality can be as effective as traditional (classroom-based) learning in terms of student satisfaction and knowledge acquisition. However, distance education does present certain challenges to clinical skills assessment. The use of simulations and virtual patients can be very helpful in addressing these challenges.

**Clinical Practice Sites**
The educational standard of care would be that all students receive sufficient clinical practice learning opportunities in high-quality clinical learning environments. High-quality evidence confirms that early immersion into a variety of clinical practice sites is beneficial, has a strong impact on students’ perceptions of themselves as future professionals, and confirms their commitment to the chosen profession. Facilitating such arrangements requires collaboration and inter-organizational partnerships between the academic and the clinical community (administrators and providers).

Several systematic reviews offer modest support for the value of two or more health professions learning together in academic and clinical settings, coming to know the complementary skills and contribution that each offers in health service delivery. A few studies have demonstrated that multidisciplinary learning has positive effects on client outcomes, particularly in the areas of better provider-client communication and service utilization.
Influencing Factors
A number of issues were envisioned as additional factors that influence the opportunity for students to acquire competence at the time of graduation from the educational environment, and then to translate that learning into a demonstration of competence in the work setting. These same factors may influence the progression of any individual along the continuum from novice to expert (i.e., from the level of a competent [safe] practitioner to the level of a proficient provider of health care services). However, very few higher tier studies were identified that addressed these very critical issues.

A limited body of literature links elements of PSE to the goal of preparing practitioners to produce an adequate supply of health workers, with the correct skill mix, to address the country’s specific burden of disease. The most prominent focus of this discussion is the preparation of medical workers for generalist practice in rural and remote settings. The literature is also characterized by many descriptive (but few evaluative) studies that discuss the importance of education of non-physician providers as essential members of the health care workforce.

The importance of professional regulation by governmental authorities and by professional association self-regulatory mechanisms (e.g., accreditation standards, clinical practice guidelines, certification of graduates) is supported in the interest of protecting the public. However, the literature offers only descriptive information about the manner in which such regulation is designed and implemented, and its effectiveness in achieving its intended outcomes. The literature about the relationship between engagement in continued professional development activities and subsequent changes in practice knowledge, skill, or behavior is very useful in any discussion about continued competency and re-licensure. However, this body of literature can only offer an indirect (inferential) link between PSE and professional practice.

The Context of Health Service Delivery
The degree to which countries can be successful in reaching indicators and targets set for coverage of health services is affected not only by the numbers of practitioners in the country who are educated with the right skill mix, but also the degree to which practitioners (including new graduates) are deployed to settings in which this right “skill mix” can be used most effectively in time and place. Descriptive studies abound that discuss the adverse impact that arises when human resources are not used in a way that maximizes their highest potential. Some circumstances can lead to loss of competency—for example, when deployment to the work environment is delayed following graduation, or when the practitioner is given assignments that are outside the primary focus for which he or she has been prepared. The literature is also very rich in its assessment of the added value of continuing professional development (in-service education). These activities have been demonstrated to have some degree of effect on promoting knowledge retention and skills enhancement. These and other factors are characteristics of the enabling environment, for which abundant literature exists, but not in the context of PSE.

Performance Outcomes
No studies were identified that linked elements of quality PSE to the performance outcomes predicated in this conceptual model (i.e., lifesaving practices implemented and professional behaviors demonstrated). Many high-quality studies do examine both of those issues in the context of continuing professional education.

The foundation for respectful attitudes and ethical behaviors should be established during the formative professional years. Essential competency lists delineated by professional regulators, associations, and policy bodies all note that these issues are fundamental components of PSE programs.
Community Outcomes

*Client satisfaction* is an outcome that is assessed in a number of studies of inter-professional education, and these studies generally report positive client responses to receiving team-based care. Similarly, a number of studies that attempt to assess satisfaction with care when the ethnic and cultural backgrounds of clients and providers are more congruent also indicate a trend toward a higher perception of the cultural sensitivity of the provider. The ideal is that clients are able to distinguish the quality of services offered, and speak up to demand high-quality care of sufficient variety and quantity to meet their personal and community needs (*client healthy behaviors increased* and *increased service utilization*).

Educating a sufficient number of health care workers addresses only part of the human resource crisis in many countries. *Retaining health practitioners* over time (retention within the HOP for which an individual has been educated) and in place (geographic distribution) present equally compelling challenges. Producing and retaining a health workforce is essential in striving to achieve these three outcomes—*satisfaction, service utilization*, and *healthy behaviors*. However, the literature’s exploration of these factors, as they are linked with PSE, is not well developed.

Health and Health Systems Impact

The literature is very rich in reports of the short-term as well as the longer term outcomes of continuing professional education that results in improved knowledge and the acquisition of critical, lifesaving skills. However, very few studies make the link between PSE and these same outcomes, and even fewer could be identified that examine the impact on the health system, that is, *reduction in adverse events of care* (e.g., reduction in costs for neonatal intensive care services), on improvements in the *quality of life* of clients served, or on health impact, such as *reductions in indicators of morbidity and mortality*. Nevertheless, the logical argument is made that an adequately trained and competent staff—produced through high-quality PSE and sustained through continuing professional development activities—is the key to achieving these desired outcomes.

Conclusion

We provide a conceptual framework for PSE that reflects the investments that countries must make in developing high-quality PSE programs. PSE programs must be capable of preparing graduates who are competent to perform—at the time they enter the workforce—the assigned duties and functions of the country’s HOPs. We urge a parallel and concurrent investment in the following areas: a) ongoing monitoring of program quality and quality improvement initiatives; b) continuing professional development, to update knowledge and skills of health cadres in an era when science is emerging rapidly, and to sustain health workers’ commitment to life-long learning; and finally, c) longer term basic and operations research designed to demonstrate the value of any country’s investment in PSE. Priority areas for this research are identified.
INTRODUCTION AND BACKGROUND

Background

Jhpiego is a recognized leader in health occupational and professional worker education and training. For nearly 40 years Jhpiego has implemented more than 120 professional worker education programs in more than 35 countries. The enhancement of knowledge and the development of competency-based skills needed for optimal job performance characterize Jhpiego’s approach to pre-service education (PSE) and training programs focused on sustaining the continuing competency of the health care workforce. (See Box 1.) Jhpiego’s comprehensive educational strategy is reinforced by its corollary system for developing high-quality educators and trainers and its attention to well-managed training. Given its applicability to education and training of a wide range of cadres, Jhpiego’s approach has gained widespread acceptance throughout the developing world, as well as the respect of governments, donors, and other international stakeholders. Components of the vision for the Jhpiego Global Learning Strategy are presented in Appendix A.

The need to maximize the effectiveness and efficiency of education and training has never been greater. Decreasing global resources, a pervasive critical shortage of skilled health workers, and a growing disease burden are all factors driving requests for the pre-service preparation of health providers who can demonstrate the ability (i.e., the competence) to provide high-quality health care services at the time they enter the health care workforce.

Quality PSE is, however, both a process and a product that must be facilitated by the interaction of a number of factors working in concert. These factors include promoting the sufficiency, usability, currency, and effectiveness of teaching and learning methods that are compliant with legal, ethical, and social contracts [1]. Together, these methods must facilitate the acquisition and demonstration of competency—within a defined scope of practice, but also within a collaborative, client-oriented health system that reflects local country needs [2], [3], [4], [5], [6]. This context of pre-service educational programming has the ultimate goal of advancing health equity—within and between countries—in the best interests of health workers, country governments, and the populations served [7].

Box 1: Competency Definitions

| Competence: The combination of knowledge, psychomotor, communication, and decision-making skills that enable an individual to perform a specific task to a defined level of proficiency.¹ |
| Competency-based education: Teaching, learning, and assessment activities that are intended to enable students to acquire and demonstrate a predetermined set of knowledge, skills, and behaviors as the outcome of learning. The intended outcome of a competency-based program is a health professional who can practice at a defined level of proficiency, in accordance with local conditions, to meet local needs. |

¹ This definition was adopted by Jhpiego for inclusion in the glossary. We are aware of an alternative definition that is equally acceptable to this discussion (i.e., “competency is the habitual and judicious use of communication, knowledge, technical skills, clinical reasoning, emotions, values, and reflection in daily practice for the benefit of the individual and the community being served” [8]).
Purpose and Objectives

Jhpiego has stated its commitment to assessing the process and outcomes of the interventions in which it is engaged. This commitment leads logically to the development of an evaluation platform for its current and future work. Therefore, Jhpiego has conducted this integrative review of the literature (see [9] for a description of the integrative review methodology) to examine what is presently known about factors that influence the quality of PSE programs. This literature synthesis provides a foundation for a conceptual model of PSE, which offers a visual depiction of the proposed relationships between factors (inputs and processes) that lead to a hypothesized desired outcome.

The purpose of the model is to describe the logical links between inputs (e.g., activities, resources) that can strengthen health occupation or profession (HOP) PSE systems, and the ultimate public health impact. The model should enable Jhpiego to articulate the components of good PSE programming to the global community of educators in the health field, and to the policymaking bodies at global country levels. Defining the components of good PSE programming can help stakeholders prioritize their investments (i.e., articulate clearly the ways in which high-quality PSE can inform program development).

The model can be used to

- guide routine HOP PSE monitoring (e.g., indicator development) and provide a framework for project evaluation;
- offer a graphic depiction of Jhpiego’s internal vision of its work in HOP PSE, for use in new business development and policy advocacy;
- serve as the vision statement for intended outcomes of Jhpiego’s work in HOP PSE;
- provide a framework for designing a research agenda (for Jhpiego, educational and public health researchers, and/or collaborative partners) to test empirically the links between components of the model, in part or in whole (demonstrating the value of the impact of PSE on populations).
METHODS

Developing a Core and Collaborating Team

A core team was created to guide the development of the conceptual model. Five members were appointed from the Jhpiego Global Learning and Monitoring, Evaluation and Research offices and from clinical programming offices (e.g., Maternal and Child Health Integrated Program [MCHIP]). An external consultant was selected to assist the team throughout the term of the development effort.

A 10-member collaborating team was then invited to participate as external reviewers for the work accomplished by the five-member core team. Collaborating team members represented Johns Hopkins University researchers, the United States Agency for International Development (USAID) Office of Global Health, and members from various Jhpiego departments involved in academic and clinical programming.

Envisioning the Model

Deliberation of the essential elements of the model occurred throughout the term of the project. A first consideration was the order of precedence (i.e., whether the literature review would be used to generate the components of the model, or alternatively, the literature would be used to support elements widely acknowledged in the global health community to be important components of quality PSE). Table 1, for example, offers a comparison of the domains that frame the standards for PSE for professional midwives [10], [11]; nurses and midwives [12]; and physicians [13]. Group members also pointed to similar visual depictions of core elements of PSE programming that Jhpiego had already developed—(e.g., Conceptual Framework for Improved Education in Health-Related Teaching and Learning Institutions [14] and Pre-Service Education Program Roadmap [15]).

The decision was made to begin by developing a visual model that depicted the elements already agreed-upon as essential to quality PSE (direct influences). Then the literature review (and perhaps the model) would be expanded to identify additional factors that might influence the effectiveness of measures designed to improve the quality of HOP education [16]. Next, the model would be crafted to predicate the outcomes and impact of quality PSE [17].
Table 1: Educational Standards: Domains Cited by Three Major Professional Organizations

<table>
<thead>
<tr>
<th>International Confederation of Midwives</th>
<th>World Health Organization</th>
<th>World Federation for Medical Education</th>
</tr>
</thead>
<tbody>
<tr>
<td>Organization and administration</td>
<td>Faculty (academic, clinical, professional development)</td>
<td>Mission and objectives</td>
</tr>
<tr>
<td>Faculty (academic and clinical)</td>
<td>Admission (policy and selection; student type and intake)</td>
<td>Governance and administration</td>
</tr>
<tr>
<td>Student body</td>
<td>Curriculum (design, core, partnerships, student assessment)</td>
<td>Academic staff/faculty</td>
</tr>
<tr>
<td>Curriculum</td>
<td>Development/revision (governance, accreditation, infrastructure, partnerships)</td>
<td>Student body</td>
</tr>
<tr>
<td>Resources, facilities, and services</td>
<td>Program graduates (outcomes, attributes)</td>
<td>Educational program (academic and clinical curricula; program management)</td>
</tr>
<tr>
<td>Assessment strategies</td>
<td></td>
<td>Educational resources (physical facilities, clinical training resources, information technology)</td>
</tr>
</tbody>
</table>

Five major topics of interest, with several related influencing factors, were selected. These topics—which team members agreed have a major and direct relationship to quality PSE—became the essential components of the model, and are depicted on the “left side” of the visual model (Figure 1).

- Students
- Curriculum
- Tutors/teachers/preceptors
- Infrastructure and management
- Clinical practice sites

Regulation was also considered as an influencing factor of special note.

Serious consideration was given to the hypotheses that could be predicated as evidence of the value of quality PSE. We recognized that several elements of the political, policy, social, and workplace environments would serve to augment, or to impede, the ability of the qualified graduate to translate entry-level competencies into high-quality services. These factors are depicted on the “right side” of the visual model (Figure 1).

The following were selected as hypotheses of interest:

- Performance outcomes
  - Lifesaving practices implemented
  - Professional behaviors demonstrated
- Community outcomes
  - Clients satisfied
  - Client health behaviors increased
- Service utilization increased
- Healthier communities

- Health and health systems outcomes
  - Health workforce retained
  - Quality of life improved
  - Adverse events reduced
  - Morbidity decreased
  - Mortality decreased

Core and collaborating team members proposed several iterations of the model for consideration. Figure 1 presents the model, as adopted.

**Figure 1: Conceptual Model: The Health Impacts of Pre-Service Education**

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**Developing a Glossary**
Core and collaborating team members deliberated and agreed on definitions of terms and limitations of the scope of the review that would be conducted for this effort. Team members agreed that HOPs would be limited to those

- in which students are enrolled in a structured education program, leading to a technical credential, diploma, or degree, and
- from which the graduates are eligible to be employed as a government-recognized health provider (i.e., a job title recognized by government human resources departments).

The contents of various glossaries already developed by Jhpiego and by various stakeholder agencies were amalgamated, then reduced in scope to focus on terms used in educational programming. Consensus was reached on all terms finally included in the glossary, which serves as the reference document for terms included in the conceptual framework and in this report (available on the Jhpiego website).

**Literature Review**
A research librarian searched the electronic peer-reviewed literature from multiple databases including PubMed, Medline, the Cochrane Library, and the Cumulative Index to Nursing and Allied Health Literature (CINAHL) between January and March of 2011. Core team members selected the titles of various cadres of providers to serve as primary MeSH (medical subject headings) and key search terms. These cadres
represented the several HOPs that have been primary recipients of Jhpiego PSE efforts. Subcategories were selected that would include a variety of specialties in which the health workers might also be prepared. Various combinations of secondary search terms were used in iterative literature searches. These secondary terms included education, evaluation, and credentialing terms as well as aspects of the intended outcomes of PSE (Box 2).

**Box 2: MeSH and Key Search Terms**

<table>
<thead>
<tr>
<th>Primary Search Terms: [Allied health personnel] = clinical officers, medical doctors, midwives, nurses, nurse practitioners, physician assistants</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Subheadings</strong>: Advanced practice nursing, community health nursing, community practice, emergency nursing, family nursing, maternal child nursing, midwifery, nurse administrator, nurse anesthetist, nurse clinician, obstetrical nursing, oncologic nursing, orthopedic nursing, pediatric (medical practice), pediatric nursing, public health nursing, psychiatric nursing, reproductive nursing</td>
</tr>
<tr>
<td><strong>Secondary Search Terms</strong>: Accreditation, competency-based education, education, competency-based training, certification, credentialing, educational status, faculty, pre-service education, professional competence (competency), regulation</td>
</tr>
</tbody>
</table>

The search request was initially conducted for the years 1990 through 2011. Given the volume of literature returned (over 6,000 citations), these dates were later restricted, in separate searches, to the years 2000–2005, and 2006–2011. These restrictions generated a total of 1,742 articles, of which 138 were characterized as review articles.

**Developing a System for Categorizing the Literature**

Members of the core and collaborating teams deliberated a number of strategies for selecting and categorizing the articles that would be included in this integrative review. (See Box 3.) Team members acknowledged that single studies would almost certainly focus on one, or a few, of the various elements that served as the component factors of a fully developed PSE program, and that it would be very unlikely to find comparisons of PSE systems as a whole. It was also acknowledged that any evaluation of systems would be unlikely to identify the various weights of factors, as independent or modifying contributors to outcomes identified in comparative assessments. Representation of what was known about various issues from a global perspective was a priority consideration.

The categorization scheme was based on the design adopted by Jhpiego for a systematic review of peer-reviewed, published articles (systematic reviews, randomized controlled trials [RCTs], and program evaluations) that focused on the effectiveness of various teaching/learning approaches used within in-service or continuing professional education (CPE) activities [18]. The categorization scheme reflects the Strength of Recommendation Taxonomy (SORT) approach recommended for grading evidence in the medical literature [19].
Box 3: Methodological Definitions

**Meta-analysis:** A quantitative method of combining the results of independent studies (usually drawn from the published literature) and synthesizing summaries and conclusions that may be used to evaluate therapeutic effectiveness, plan new studies, etc. It is often an overview of clinical trials.

**Systematic review:** A review of a clearly formulated question that uses systematic and explicit methods to identify, select, and critically appraise relevant research and to collect and analyze data from studies that are included with the review.

**Integrative review:** A form of research that reviews, critiques, and synthesizes representative literature on a topic in an integrated way. This type of review can be used to generate new frameworks and perspectives on the topic.

The literature grading criteria (research design and number of groups, grades 1 through 5) designed for both the PSE and CPE projects were expanded to include two additional grading levels (6 and 7) to accommodate the type of literature retrieved for the integrative review of PSE. Table 2 depicts these grading criteria, and the three quality tiers (the SORT tiers) that are represented by these evidence grades.

<table>
<thead>
<tr>
<th>Design</th>
<th>Types of Groups</th>
<th>Literature Grade</th>
<th>Tier</th>
</tr>
</thead>
<tbody>
<tr>
<td>Meta-analysis</td>
<td></td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Systematic or integrative review of literature</td>
<td></td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Experimental</td>
<td>Between subjects (experimental and control)</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Within subjects (crossover)</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Quasi-experimental</td>
<td>Nonequivalent control group</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Repeated measures</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>Pre-experimental</td>
<td>Comparison group</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Pre-test/post-test</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Post-test only</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>Descriptive studies</td>
<td>Retrospective</td>
<td>6</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Case series, correlation</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Prospective/cross-sectional</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Literature review (descriptive)</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>Qualitative studies</td>
<td></td>
<td>7</td>
<td></td>
</tr>
</tbody>
</table>

A second level of grading was also adopted for the PSE review. Kirkpatrick's four-level model of training evaluation was selected as the strategy to affirm that the studies selected in this review addressed the broader
spectrum of process and outcome of PSE [20]. An adaptation of Kirkpatrick’s original definitions was included [21] so that knowledge and attitudes were distinct in focus. This exact approach is also adopted for the Best Evidence in Medical Education (BEME) reviews. Given the PSE focus of this review, the definition and focus of Kirkpatrick’s Level 1 was even further broadened by the authors to include assessments of programs as well as students within programs. This focus is depicted in Table 3.

Table 3: Effects of Training: Kirkpatrick’s Levels of Training Evaluation (Adapted*)

<table>
<thead>
<tr>
<th>Level 1: Reaction</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.a. Assessment of student reactions to the teaching program and methods (e.g., satisfaction)</td>
</tr>
<tr>
<td>1.b. Programmatic assessment of satisfaction with strategies and methods (e.g., recruitment and retention)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Level 2: Learning</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.a. Modification of attitudes and perceptions</td>
</tr>
<tr>
<td>2.b. Measurement of change in knowledge (principles, facts, techniques, skills) as an outcome of the training event</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Level 3: Behavior</th>
</tr>
</thead>
<tbody>
<tr>
<td>Changes enacted on-the-job (e.g., clinical practice) subsequent to, and attributed to, the learning event</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Level 4: Outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.a. Measureable results of the training program in terms of system (e.g., reduced costs, higher quality)</td>
</tr>
<tr>
<td>4.b. Benefits to clients or patients, client outcomes (e.g., improved health statistics)</td>
</tr>
</tbody>
</table>

* [21]

Retrieving Articles and Extracting Data

The title and abstract of each of the 1,742 articles remaining after limitation of the searches (described above) were scanned for their potential value to the issue of PSE. A research assistant conducted the initial review of titles and abstracts, selecting all articles that had a primary focus on PSE, and were in accordance with the inclusion criteria. The research consultant reviewed the results of the preliminary scan, and after discussion with the research assistant, made the final determination of articles that would be included in the first in-depth review.

Articles specifically deleted from consideration during this initial review and during the subsequent phases of literature review, sorting, and grading were articles that reported experiences that were unlikely to have wide, generalizable application (e.g., articles that reported a one-time or short-term experience at a single educational site), articles that were very narrow in focus (e.g., assessment of changes in courses or program policies at a single institution, without intent to create models for replication), and articles that reported very limited sample sizes. Articles that reported on post-graduate training events (continuing professional education and in-service education) were excluded from the PSE review (although not from the discussion) so that the review could focus as precisely as possible on the essential elements and methods of PSE. Opinion pieces, editorials, commentaries, book chapters, and project reports (gray literature) were also excluded.

In total, the two reviewers (the primary search) identified 124 articles with an explicit focus on PSE that were considered to be a “best fit” with the major topics of interest. A number of bibliographies available in the literature [22], [7] or generated in the process of Jhpiego’s extensive internal and external engagement in PSE were also hand-searched to glean additional higher tier articles of relevance. This secondary search yielded an additional 14 studies. These articles were downloaded into RefWorks® data management software. An Excel® spreadsheet was created to assist in documenting information extracted during review. These articles were then sorted by topic area, and graded using the criteria noted above. In total, 52 articles (38 from the primary search and 14 from the secondary search) were retained after this process.
This initial process indicated a need to search, generally, for articles of higher graded quality, and specifically, for several topic areas. Two supplementary literature searches were conducted. One supplementary search, conducted by a second external consultant (Claudia Vera), specifically focused on the health outcomes and impact that had been predicated for inclusion in the model. The other supplementary search used the search term “health professional education,” but restricted the search to summary articles (Tier 1 grade as defined for the project) published between 2000 and 2011. This search was conducted in PubMed, Medline, Cochrane, and CINAHL databases. An additional 82 unduplicated studies were retrieved, of which 45 were retained after data quality review. A total of 97 articles were finally entered into consideration, of which N = 31 were graded as Tier 1, N = 15 as Tier 2, and N = 51 as Tier 3. Figure 2 outlines the inclusion process.

Figure 2: Inclusion Process
RESULTS

This literature review focuses first on Tier 1 and 2 studies so that the strongest evidence in support of the elements of quality PSE envisioned in our model can be presented. However, given the nature of the topic, and in accordance with the science of this integrative review, these findings are augmented and supplemented by lower tier studies, when necessary, to address an area of interest in the discussion.

DIRECT INFLUENCES

Our conceptual model (Figure 1) depicts the factors that we believe have a direct effect on the quality of PSE programs. Each direct factor comprises several component elements. Findings from the literature addressing these topics are discussed in the sections that follow. These findings are summarized in Appendices B through F.

Students

Qualified Student Body

A limited body of literature focuses on the characteristics that are most representative of those students who are likely to be successful in the program of studies. An exhaustive review of health professions literature [23] was conducted to examine the evidence to support the use of various selection tools. This review finds pre-admission grade point average (GPA) to be clearly the best predictor of academic performance in all of the health professions; however, the relationship between pre-admission GPA and clinical performance is less clear. This review also notes that the Medical College Admission Test (MCAT) serves as a good predictive tool for medical students, but similar tests do not exist for other health professions. A number of aptitude and related standardized tests (such as tests of critical thinking) are available, but their relationship to academic and clinical performance is indirect. The literature indicates that personal interviews and written statements require grading matrices in order to improve inter-rater reliability.

Possessing a minimum of secondary-school education was found to be important [24], but urban or rural residence of applicants was not a predictor of academic success [25]. It was also noted [24] that post-secondary applicants were more likely to be influenced in their choice of career by parental expectations, while “post-tertiary” applicants (those who had already attained some college credit) were more likely to express personal reasons (i.e., a specific interest in the HOP) for their career choice, although both groups were equivalent in their academic success. The lack of expression of a specific interest in the profession was also identified as one of four factors that were predictive of student attrition [26].

Pre-admission (bridge) programs were helpful for medical school aspirants from minority and disadvantaged backgrounds. Aspirants who participated in these programs were more likely to gain admission when compared to students who did not participate in such programs. Participants demonstrated higher MCAT scores (odds ratio [OR] 8.06; confidence interval ([CI], 4.08–9.71) [27].

Student Support and Retention

Findings from an integrative review of 15 studies on retention of nursing and midwifery students [28] indicate that personal commitment and good support are essential to retention. This support was variously defined in other studies, but included financial aid [26], academic mentorship [29], [30], and peer tutoring [31], [32]. A systematic review of peer tutoring studies (20 studies that included a control group) found that in most studies peer tutoring had a positive impact on academic performance. These studies compared students who received peer tutoring with students who received no additional tutoring (10 studies), or with students who received faculty tutoring (10 studies). The authors [31] indicated, however, that the quality of all included studies was limited.
A study conducted in Croatia [33] found that students from urban backgrounds scored statistically significantly higher on academic indicators (p = 0.022) and research involvement than students from rural or remote areas, who were more likely to have a study year failure (p = 0.032). Rural and remote students were also the most likely to experience multiple years of failure (p = 0.030). These findings are inconsistent with the small body of literature on student admission, where location of residence at time of application was not a factor in admission test scores.

A longitudinal cohort study of nursing students [34] used logistic regression to identify predictors of retention. Findings that are generalizable beyond the specific United Kingdom (UK) setting in which this study was conducted indicated that older students were more likely to sustain enrollment, and males were more likely to withdraw. The authors point to the difficulty of conducting such analyses on categories of “diversity” (race and ethnicity), given the multiple definitions and categories within this dimension.

Focus groups were conducted among students who withdrew from midwifery studies [35]. No overriding compelling reason was identified for student withdrawal; rather a complexity of personal reasons and an accumulation of clinical and theoretical demands forced the choice.

**Curriculum**

**Competency-Based Curriculum**

Competency-based education (CBE) is an outcomes-based approach to the design, implementation, assessment, and evaluation of health professional education programs. A set of pre-determined outcome competencies is used as the organizing framework for the education program (i.e., a competency-based curriculum). The term CBE is used widely throughout the contemporary PSE literature. A systematic review was conducted [22] to identify consensus on a definition of the term, and on the elements that comprise approaches to CBE.

The synthesis of definitions includes four major themes that characterize the meaning of a competency-based curriculum: a) an organizing framework for the curriculum is in place, b) a rationale is set forth for selecting this approach to curriculum design, c) this approach is not time-bound, and d) various curriculum designs are implemented in practice. Six descriptive subthemes are also identified: a) outcomes of learning are defined, b) the curriculum is organized around a specific set of competencies, c) abilities must be demonstrable, d) assessment is criterion-referenced, e) teaching and learning strategies are learner-centered, and f) societal needs are considered (i.e., CBE is a mechanism to align curriculum goals with patient needs and optimal health care delivery).

There is considerable policy debate, at least in nursing, about whether health professionals should be educated within technical (leading to a certificate of completion) or academic (culminating in at least a baccalaureate degree) programs of study [12]. No contemporary studies were identified that compared the graduates of these programs in terms of competence in the workplace.

An innovation in curriculum design that is widely promoted as a modality for the enhancement of learning is problem-based learning (PBL). PBL was introduced as a radical way of rethinking student engagement with the curriculum, whether in traditional classroom, or in distance education program designs. PBL is itself widely described and discussed in the literature, and many assessments have been conducted to compare PBL to traditional curriculum designs.

A systematic review [36] attempts to draw inferences about which of four popular models for undergraduate nursing curriculum (including PBL) are better in terms of fostering knowledge, as well as inferences about the
effects these models have on client and health systems outcomes. Unfortunately, this review found too little evidence to draw conclusions about PBL; the authors also note that a number of different definitions of PBL appear within the included studies. A second systematic review [37] compares PBL to other enhanced learning approaches. The authors find that PBL is not well understood by clinicians, and they find little evidence to support PBL as a strategy for teaching health professional undergraduates in the clinical setting.

On the other hand, a comparative assessment of students who studied in a traditional versus a problem-based educational program found that a PBL curriculum was associated with improvements in well-being and higher performance [38]. PBL students expressed fewer concerns about the academic load (p <0.0005), reported fewer problems encountered in the clinical setting (p = 0.028), and scored higher on an assessment of general coping (p <0.0005). The PBL students did, however, score lower on a number of comparative essay examinations.

These findings were not confirmed in an evaluation [39] of PBL versus traditional teaching methods on a specific topic that used objective test scores as an outcome measure. This nonequivalent control group design demonstrated no difference in outcome. A repeated-measures post-test [40] included the same cohort of students. PBL participants scored higher one year after original instruction.

Other studies that examined very specific outcomes of the PBL curriculum approach included a historical cohort comparison study [41] that compared three groups of physicians (who had graduated prior to the transition to a community-based PBL curriculum) with a medical graduate cohort (who graduated one year after the transition). Patient care outcomes favored the PBL cohort: continuity of care was greater, drug prescribing behaviors improved (fourfold), and mammography screening rates improved.

A descriptive, qualitative assessment [42] compared two groups of nursing students from three conventional programs and four PBL programs across South Africa. Students who had studied in the PBL were graded higher on their description of problem-solving, critical incidents. A study [43] compared students from PBL with traditional curriculum cohorts to determine their attitudes toward providing care for medically indigent patients. The authors also analyzed data by gender. It was found that, although attitudes grew less favorable over time from admission to graduation, they did not differ as a function of curriculum or gender.

Three additional studies are relevant to the discussion of a competency-based curriculum. One study [44] evaluated a specific curriculum review and revision intervention that sought to ensure that curriculum content and teacher competence were sufficient to transmit postabortion care knowledge and skills. This study—also cited in a later section of this report—followed graduates over a three-year period to demonstrate a measureable impact on service provision (provider knowledge and use of manual vacuum aspiration [MVA]). Another study [45] describes the use of task analysis for generating evidence of the importance of specific curriculum components. The study produced “concrete evidence…to help ensure that changes to pre-service education are relevant and respond to national needs.” A qualitative study [46] of students, teachers, and practicing midwives suggests that the most important requirement at the time of registration for entry into practice is that “a midwife is safe and will practice safely.”

**Varied Formative Student Assessment**

Among the common elements found in definitions of CBE [22] are “demonstrable abilities” and “criterion-referenced” assessment. The latter must be conducted across the various phases of learning (formative) and when competency is predicted to have been achieved (summative). Formative assessment enables early detection of problems in academic performance, and defines the entry point for implementing strategies to help students develop better approaches for academic success and to facilitate self-directed learning [47].
The objective structured clinical examination (OSCE) is one type of assessment approach that has received critical attention in the literature. Two higher tier literature reviews and one qualitative study addressing OSCE provide examples of considerations that must be paid to all methods and approaches when assessing learning in a competency-based curriculum. (Further discussion of a wide variety of enhanced learning approaches can be found in a later section of this report.) A descriptive literature review [48] notes an extensive evidence base that addresses the OSCE process. The validity and reliability of newly structured examinations are key issues that affect the use of OSCE and all assessment modalities [49]; the length, number, and interdependence of the assessment methods and strategies need careful consideration. Findings from an integrative literature review [50] conclude that OSCEs are capable of measuring competency; however, the psychometric properties of OSCE tools have not been adequately examined, and the authors note major gaps in the discussion of this topic in all studies included in this review. The process and outcomes of an OSCE approach that was newly implemented among nursing students in Ireland were evaluated [51]. Findings from this evaluation indicate that students perceived this process to be a meaningful and fair form of assessment. After a successful experience with the OSCE process, students felt more prepared for and more confident about forthcoming clinical placements.

The very common utilization of digital media and distance education delivery technology calls for creativity in designing meaningful measures of formative assessment. Various approaches for evaluating students who are studying via this curriculum dissemination method are described [52].

**Summative Student Assessment**

A systematic review [49] was used to address the validity and reliability of various tools to assess or to confirm the clinical competence of students (both formative and summative). The authors conclude that the findings of their assessment are bound up in the various definitions of competence and competency. Accordingly, the need for a multi-method assessment approach was affirmed. A second systematic review [53] addressed a wide variety of methods for assessing clinical competence. The authors affirm that assessment of clinical competence is at the center of nurse education, and note that rigorous instruments and methods for assessing competence are lacking. This integrative review was repeated ten years later, including only those more recently published studies [54]. These authors reaffirm that consensus has not yet been reached on a global definition of competence. Results of these reviews point to the need for a clearer and more universally accepted definition of competence, if indeed competency-based assessment in nursing is to achieve wider national and international cooperation.

**Curriculum Aligned with National Health Priorities**

The task analysis [45] offers an example of a highly sensitive approach to identifying, documenting, and confirming the core PSE curriculum elements that are relevant to country-specific (Liberia) needs and expectations of providers. The task analysis process can be conducted periodically to confirm the continued congruence of PSE and the context of clinical health care practice. A similar descriptive report addresses U.S. midwifery/nurse midwifery practice [55].

The specific curriculum content of quality improvement (QI) and patient safety was examined in a systematic review [56]. These two topics have been identified as very important topics in any undergraduate medical curriculum, and were noted [57] to be a global concern that needs to be addressed by educators in the health professions. The systematic review was designed to assess whether inclusion of this content brought about changes in practice behavior. This review [56] included 41 studies, each of which included a longitudinal assessment of graduates in practice. Thirteen of these studies showed successful changes in local care delivery (QI), and seven showed significantly improved target processes of care in these two, very specific topic areas.
The need to prepare students for practice in lower-resourced, rural, and remote settings is an issue of critical importance in many countries. A number of reports from many global settings describe the emphasis placed on primary care within the curriculum (studies not cited). At the same time, a number of reports indicate that this issue has to be addressed even prior to the program of studies, noting that student recruitment and admission incentives have much to do with future intentions and actions following graduation. The following demographic factors were found to be variously influential in post-graduate placement choices: a) recruitment of students from rural and remote residential settings [58], [59], [60], [61], [62]—ORs exceeding two in the Laven and Wilkinson study, and 1.95 in the Mathews et al. report; and b) applicants’ expressions of positive attitudes and values toward rural practice as a career choice [58]. A Cochrane review of this same topic was attempted [63] but the authors report that no qualifying studies were identified (although the Laven and Wilkinson review was available in the literature).

Several of these same studies—and additional studies—documented the positive impact of undergraduate clinical learning experiences in rural settings as a curriculum strategy. Such a strategy could increase students’ comfort in working in a lesser-resourced environment, and thereby, perhaps, change perceptions, attitudes, and values. Typically, these clinical placements were successful in influencing attitudes [58], [64], but these placements were variously successful in influencing the choice of place of post-graduate practice [65], [25], [66], [67], [68], [60], [69], [70], [71], [72], [73]. The OR favoring rural placement equaled 1.61 in the Wilkinson, Laven, Pratt, and Beilby study and 1.56 in the Mathews et al. study.

An exhaustive literature review that included one systematic review [67] explored these issues, and then conducted regression analysis of demographic indicators from 130 medical students (Tanzania). The strongest predictors of positive attitudes toward rural practice included rural background, motivation for medical studies (plan to become a family physician), and influence of training institutions. The authors suggest that to promote a more equitable distribution of graduates, medical school admission policies should focus on these factors.

Curriculum Consistent with International Educational Standards
Professional associations and health care policymaking bodies have generated recommendations and guidelines for specific groups and cadres of health professions [10], [11], [13], [12], [74] that provide guidance for aligning curricula with the scope of practice and expected competencies for these HOPs. Regulatory authorities in various countries may issue similar documents, with the intention of guiding country-specific curriculum planning [75]; these documents may or may not be aligned with recommended international standards. This issue is discussed in the context of policy development [76]; no comparative or evaluative studies of the issue could be identified.

Contemporary policy guidelines, whether global or country-based, should reflect the commitment that has emerged over the last two decades to link scientific evidence with clinical practice. Evidence-based clinical practice guidelines should be woven into the theory and clinical skills components of the curriculum [75], [77], [78].

Teachers/Tutors/Preceptors
Teachers/Tutors Competent in Technical Areas
The entire population of nurse faculty in Norway was included in a survey to determine perceptions of the most important domains in nurse educator competence [79]. Five domains emerged from the analysis: nursing competence, teaching skills, evaluation skills, personality factors, and relationship with students. Within the nurse educator competence domain, the highest ratings went to “encouragement of students to
combine theory and practice” (mean 3.91 on four-point scale) and “high regard for clinical skills (mean 3.76).”

**Teachers/Tutors Competent in Classroom Teaching**

The Norwegian survey [79] also addressed the relationship between teachers’ opinions about the importance of nurse educator competence and teaching practice. Significant positive correlations were found for various items, including “takes responsibility for actions” (r = 0.25, p < 0.05), but a surprising negative correlation was found for the item “is prepared to admit mistakes” (r = -0.15, p <0.01).

Descriptive commentary about the assumptions that underpin effective teaching and assessment in the health professions is offered [80]. The commentary references five systematic reviews conducted between 1998 and 2007 that examined the effectiveness of teaching interventions (i.e., how effective they were in addressing knowledge of critical appraisal, attitudes, skills, and evidence-based practice [EBP] behavior). (None of these five studies qualified for inclusion in this report—either because they were older studies or they focused on post-graduate education.) The authors draw the conclusion that teaching interventions have a greater impact on knowledge and skills (Kirkpatrick evaluation Levels 1 and 2) than they do on sustainable EBP behaviors (Kirkpatrick Level 3).

The factors that generate good teachers (i.e., faculty development initiatives) were addressed in a systematic review [81]. In total, 53 papers were reviewed. Of these papers, six (11%) were RCTs; the majority (N = 47, 89%) were quasi-experimental in design, with two that included a comparison group. The review used the Kirkpatrick evaluation criteria to categorize findings. Most participants in faculty development activities were satisfied with the learning activities (Level 1b), and reported increased motivation, self-awareness, and enthusiasm for the use of learner-centered techniques (Level 2a). Participants reported changes in knowledge and skill, specifically a greater understanding and use of specific teaching skills and behaviors (Level 2b). Teachers also reported improvements in their teaching abilities and use of specific approaches to teaching (Level 3)—such as use of experiential learning and greater provision of feedback. Level 4a findings were limited in quantity; however, three studies indicated that faculty who participated in the studies intended to be leaders of change in their own practice settings.

**Clinically Competent Teachers/Tutors**

A qualitative study [82] was conducted to determine what academic educators perceived to be the benefits of and barriers to including clinical practice as part of their academic role. Barriers included insufficient time, heavy workload, and a lack of value for the clinical role. Educators’ undertaking clinical practice was perceived to increase the quality of teaching. Alternative interpretations of the clinical role included undertaking research projects and supporting and supervising students.

**Competent Preceptors**

The need for competent teachers to guide and direct students in clinical learning settings (simulation labs and clinical health care settings) is parallel to the need for competent classroom teachers [83]. One study [84] examines Practice Education Facilitators in Scotland. The facilitator’s role is to develop the skills and abilities of nursing staff members who also serve as clinical teachers (preceptors or mentors—terms vary) for nursing and midwifery students. Mentors were surveyed to identify the aspects they felt were most important to the role. The three top cited responses were “supervising students” (N = 41, 59%), “making students feel welcome in the practice setting” (N = 38, 55%), and “planning a program of learning for students” (N = 24, 35%). Barriers to implementing the role of mentor included conflicts of interest that resulted from the demands of clinical care (N = 28, 41%) and managers’ lack of recognition of the demand placed on the individual mentor (N = 13, 19%).
A program in New Zealand teamed clinical preceptors with Maori (indigenous New Zealanders) health professionals to improve preceptors’ skills in working with students placed among the Maori during their learning experiences. Thirteen focus group participants were included in an evaluation of this program [85]. Students reported increased knowledge of culture and customs. Maori health practitioners developed clinical leadership skills and advanced their career paths.

A qualitative study [86] examines the elements of preceptorship. This study notes the variety of roles that preceptors are expected to assume, and makes the point that preceptorship is a complex and time-consuming activity that requires educational preparation and support, including peer support. The study identifies the following skills that preceptors need: teaching, identifying learning needs, prioritizing, and time management. Respondents in this study suggested that having contact with other preceptors—as well as regular contact with academic staff—would provide needed support. The authors note that open dialogue and communication between the preceptors and lecturers would provide important and necessary information, particularly with respect to the learner’s level (i.e., the learning curve, the point to which the learner has already progressed in the curriculum, and what the learner is expected to know). The authors conclude that clinical teaching and supervision is a skill, and it cannot be assumed that, by virtue of their knowledge and expertise, practitioners can automatically function as preceptors.

The dynamics of one-to-one preceptorship are explored [87] to determine whether this approach would be more beneficial than traditional clinical teaching relationships (e.g., clinical faculty supervision of a group of students). The review included 15 quasi-experimental, pre-test/post-test designs, seven of which included a control group, and one descriptive study. Findings indicated that participation in a one-to-one preceptorship program increased role conception and performance on the part of students. This increase resulted, in part, from direct role-modeling by the preceptor. However, no evidence was found that preceptorship promoted critical thinking, clinical competence, or improvement in licensure examination (National Council Licensure Examination-Registered Nurse [NCLEX-RN]) pass rates.

**Sufficient Teacher/Tutor/Preceptor/Student Ratio**

No studies were identified that addressed this issue directly. Professional association guidelines or country regulatory authorities may set specific benchmarks and standards (e.g., one faculty to X number of students in a clinical practice setting). It is intuitively apparent that quality instruction depends on the ability of a teacher to interact with students, identify learner needs, and be responsive in feedback and assessment.

Moreover, the fundamental principles of competency-based education predicate that each student must be allowed sufficient time as well as sufficient clinical practice opportunities to acquire and to demonstrate knowledge and skills. Some students will require remediation. Each of these objectives must be accommodated in the classroom and clinical teaching/learning settings. A recent commentary [88] on the quality of preceptorship for midwifery practice in Africa concludes that PSE falls short in terms of adequate numbers of committed and well-informed preceptors to ensure optimal competency-building.

The initial preparation [89] and the retention of teachers, tutors, and preceptors—along with their continuing professional development—are corollary concerns in quality PSE. These issues are discussed in other sections of this report.
Academic and Clinical Teaching Linkages

A literature review [90] explores the elements of sound partnerships between nursing faculties and health service providers. This review searched the business literature for models. The authors infer that both parties need to identify good reasons for such linkages; the stakeholders need to place an equal and balanced value on the relationship; this relationship must be fostered by the “right people” (leaders, invested with time and authority to foster the linkage); and trust and respect must be mutual. Good communication and formal statements of collaboration are essential.

To reduce the theory/practice gap, new arrangements/contracts have been formed between academic and clinical organizations that provide nursing/midwifery education [91]. Key elements of a framework for this partnership include the context (purpose of the partnership), the environment (number of partners and steering groups), the inputs expected from each partner, the processes by which the relationship is enacted (e.g., decision-making, planning, and managing conflict), the skills required of those who contribute to the effort, and a statement of the outcomes expected by all partners. The role of the clinical coordinator, who maintains contact with students and teaching staff, is essential.

A descriptive survey [92] explores the experience of District Nurses (DNs) in Sweden who are also responsible for supervising nursing students. The DN experience is examined prior to and following implementation of a new supervision model. At baseline, the majority of DNs indicated that conditions for supervising students in the workplace were adequate. However, they noted difficulty in keeping up to date with changes in nurse education programs, and in receiving support from the university and/or from their clinical managers. Setting aside sufficient time for this additional responsibility was noted as a challenge. Following implementation of the new model, which was characterized by stronger academic program linkages, DNs noted that information about what was expected of the DNs and the students was more readily available, and that conditions in the work setting had been improved to accommodate DNs’ responsibility for supervising student nurses.

Continuing Educational and Clinical Updates

Evidence found in the continuing professional development literature offers some insight about what can be hoped for as an outcome of strengthened pre-professional education. A review of methods used in impact studies that assess the value of continuing education (CE) for health professions concludes that CE can improve knowledge, skills, attitudes, behavior, and patient health outcomes [93]. In a more recent rigorous systematic review of the literature, the Johns Hopkins Evidence-Based Practice Center explores the most effective approaches for continued professional development of health educators. The reviewers conclude that—despite the lesser quality of the evidence included in the systematic review—continued medical education appears to be effective in improving those very same outcome indicators. The summary indicates the need for more research to determine the types of media, techniques, and degree of exposure (e.g., length of program offering) needed to demonstrate some effect of CE on improved health outcomes for clients [94].

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2 The continuing professional education (CPE) literature is not discussed in the narrative, or depicted in table form, because it is outside the scope of this PSE-focused report.
Infrastructure and Management

Educational Facilities, Resources, Libraries, and Laboratories

The need for an appropriate environment for academic teaching and learning would seem to be self-evident. Therefore, it is not surprising that little in the literature speaks to the physical elements of the learning environment (things such as physical space), or teaching/learning tools (such as textbooks and clinical models). However, recent descriptive literature speaks of three infrastructure elements that require new or renewed consideration in the contemporary, evidence-based educational era. Modern, Internet-enabled medical libraries [95], skills and simulation laboratories [96], and computer laboratories to support computer-aided instruction [97], [98], [99] have been promoted as “essential enhancements” to teaching and learning for the HOPs. It is noted [97] that only a small proportion of the reports about computer-aided instruction published through the year 2000 are evaluative in nature, and these authors caution that evidence in support of this technology is needed to support wider adoption and scale-up. Simulation as an educational tool is discussed in a later section of this report.

Enhanced Learning Approaches

The topic of new approaches to teaching, tried and tested for their impact on improving learners’ knowledge and skills, yielded the greatest volume of information, and most of it was higher tier. The literature is augmented by studies that assess the acceptability of these methods from the learner’s perspective.

The use of electronic modalities as a curriculum dissemination strategy is well represented in this body of literature. Terminology varies, but this topic is commonly referenced as Internet-based learning or distance education.

A meta-analysis [100] examines two systematic reviews of Internet-based learning. Internet-based instruction for health professions learners is compared with no intervention, and with non-Internet interventions. The pooled effect size (ES) in this meta-analysis favored Internet-based instruction—when compared to no intervention—in improving knowledge (ES = 1; 95% CI, 0.90–1.10; p <0.001; N = 126 studies), skills (ES = 0.85; 95% CI, 0.49–1.20; p < 0.001; N = 16 studies), and learner behaviors and patient effects (ES = 0.82; 95% CI, 0.63–1.02; p <0.001; N = 32 studies). Pooled ESs also favored the Internet, although less strikingly—when compared to non-Internet formats—for satisfaction, knowledge, skills, and behaviors or patient effects. The authors conclude that Internet-based learning—when compared with no intervention—is associated with large positive effects, but that Internet-based learning is generally equivalent to other instructional methods.

A systematic review and meta-analysis [101] found that Internet-enhanced education resulted in extended learning time (ES = -0.10; p = 0.63). Factors that influenced time included interactivity (ES = 0.25; p = 0.089; five studies) and feedback (ES = 0.67; p = 0.003; two studies). The authors conclude that instructional strategies to enhance feedback and interactivity (e.g., audio narration, video clips, interactive models, and animations) prolonged learning time, but were significantly associated with increases in learning (r = 0.53; p = 0.021). Another systematic review and meta-analysis focused specifically on ways that Internet-based education could be improved [102]. The authors looked at the issues of practice, feedback, and repetition of study material. This analysis, which included 51 eligible studies (30 RCTs), found that interactivity, practice exercises (ES = 0.40; p = 0.01), repetition of study material (ES = 0.19; p <0.001), and feedback were associated with improved learning outcomes; however, inconsistency was found across studies.
A large meta-analysis [103] and a literature review [104] found no significant difference between classroom or live instruction and computer-delivered instruction with respect to gains in knowledge. This finding was further supported by the recent United States Department of Education meta-analysis of online learning studies [105], which found that, on average, online learning—when compared to live instruction—resulted in modest improvements, and that blended learning (combining computer with live instruction) resulted in somewhat better learning outcomes. Their analysis proposes that the blended learning approach typically includes activities not provided in live instruction and that students spend additional time with the materials in blended learning. The authors note that this finding suggests that the positive effects associated with blended learning should not be attributed to the media themselves, but rather to the engagement of students with the modalities of instruction.

A nationwide study conducted in Tanzania [106] evaluates the use of distance learning as a strategy for increasing the number and capacity of health workers. Distance learning programs at 25 health training institutions, universities, and nongovernmental organizations in the country were surveyed to identify characteristics and challenges to implementing this approach. The authors conclude that a blended, print-based distance learning model was most feasible for the country at the time because a number of barriers prevented full implementation of the distance learning approach (e.g., lack of guidelines for administrators, instructors, and preceptors regarding roles and responsibilities; absence of competencies for clinical components of the curricula; technological constraints such as lack of access to computers and the Internet; and lack of funding). Nevertheless, students were enthusiastic about the approach, and distance learners were more likely to remain in their communities following program completion.

A literature review examines the advantages and disadvantages of including computer-facilitated instruction in nursing [107]. Advantages of computer-facilitated instruction include allowing students to engage in collaborative learning across geographic boundaries, and enabling students to become more technology literate. The disadvantages include inability to assess psychomotor skills.

Distance learning requires a good deal of independent learning as well as certain technical skills. A cross-sectional study conducted among midwifery students in Poland [108] found that the age of the learner did not correlate with Internet use and evaluation of the Internet as a source of medical information, but did correlate with a self-evaluation of Internet skills as a user ($r = 0.20, p = 0.016$). Although the medical Internet was used by a majority of midwifery students, it still served as a secondary source of information after university training and medical books. When students who had received formal instruction in library literature search methods were compared to a control group, mean scores on skills were higher ($p < 0.001$) for the intervention group [109]. This finding led the author to conclude that informatics instruction is effective in improving student acquisition and retention of literature-searching skills. A qualitative assessment of students and their teachers [110] examined the experience of using pocket personal computers to document clinical experiences in a distance-learning clinical setting. Most students appreciated the fact that recording information on the mobile device was more convenient and “neat” than using a large paper-based portfolio. But they worried about losing the devices and/or the material stored in them.

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3 This report is not included in the tabled data, because it does not appear in the peer-reviewed literature. The authors have included the study in this narrative because of its importance to the topic, the large sample size, and the rigorous study methodology.
Computers are also now widely used to enhance the modality of instruction, specifically through simulation of practice-based skills. A systematic review of high-fidelity medical simulations [111] found clear evidence that under certain conditions simulations facilitate learning. These conditions included: a) when feedback is provided during the learning experience (N = 51 studies); b) when learners engage in repetitive practice (N = 43); c) when the simulator is integrated into the overall curriculum (N = 27); d) when learners practice with increasing levels of difficulty (N = 15); e) when the simulator is adapted to multiple learning strategies (N = 11); f) when clinical variation occurs in the simulation exercise (N = 11); and g) when the environment is controlled (N = 10), the learning is individualized (N = 10), outcomes and benchmarks are clearly defined (N = 7), and the validity of the simulator is confirmed (N = 4).

When simulations were compared to no intervention [112], large ESs were found for changes across all four Kirkpatrick levels of assessment. Results indicated pooled ESs for knowledge (ES = 1.20; 95% CI, 1.04–1.35; N = 118 studies), time skills (ES = 1.14; 95% CI, 1.03–1.25; N = 210); process skills (ES = 1.09; 95% CI, 1.03–1.16; N = 426), and product skills (ES = 1.18; 95% CI, 0.98–1.37; N = 54). Similar results favored simulations for their direct effect on patients (N = 32 studies). Subgroup analyses revealed no consistent, statistically significant interactions between simulation training and instructional design features or study quality.

A descriptive literature review [113] assesses virtual patients, in the form of interactive, computer-based, simulated clinical scenarios. This review reports that, within this context, simulated client encounters enhanced clinical reasoning skills. However, principles that support this approach are similar to those that support other simulations (i.e., feedback, repetitive practice, progressive difficulty, and clinical variation are needed).

A qualitative study [114] focuses on student reaction to the use of simulation in learning. Students who participated in this study appreciated learning in a safe environment prior to being placed in a clinical setting. These students viewed simulation as an innovative strategy that promotes active learning and has great potential for developing clinical competence and increasing confidence prior to practice.

Several studies address specific educational teaching techniques or multimedia methods. These studies are reviewed for the information they can provide about teaching approaches.

A Cochrane review [115], which included 12 RCTs, concludes that printed educational materials (used in PSE and in continuing professional development activities) could influence practice behaviors in terms of process (prescribing, performing procedures). Use of these materials did not, however, have statistically significant effects on patient outcomes.

Two articles [116], [117] explore the effect of using portfolios (defined as a collection of evidence of student learning, or a learning journal/diary) for their value as an approach to student assessment. The 69 studies included in a BEME systematic review [116] were drawn from assessments of students enrolled in education programs for medicine, nursing, dentistry, and other professions. Findings of this review indicate that this technique can improve knowledge and understanding, influence the ability to integrate theory with practice, and lead to increased self-awareness and reflection. A review [118] refines the definition of portfolios and the authors determine, after a descriptive review of the literature, that despite various understandings of the term, portfolios are a useful tool for documenting adult learning, specifically, the development of “reflection,” an essential component of professional growth.
A systematic review [119] explores the effect of self-directed learning (SDL) in improving learning outcomes. Findings from studies pooled in this meta-analysis indicate that SDL is associated with a moderate increase in the knowledge domain (standardized mean difference [SMD] 0.45; CI, 0.23–0.67), a trivial and non-statistically significant increase in the skills domain (SMD 0.05; CI, 0.05–0.22), and a non-significant increase in the attitudes domain (SMD 0.39; CI, 0.03–0.81). SDL was more effective when learners were involved in choosing it as a learning method. Advanced learners seemed to benefit more from SDL.

A systematic review [120] addresses the effect (influence) of peer teaching on student cognitive and psychomotor learning. No statistically significant differences were found; however, students noted increased confidence in clinical practice and improvements in learning.

A literature review of use of standardized patients as a teaching/learning tool [121] uses Kirkpatrick’s evaluation schema to categorize studies. Findings indicate that this teaching method generated positive effects for satisfaction, knowledge, skills (total of 41 studies) and behavior change (five studies).

A similar literature review [122] addresses the importance of reflection and reflective practice across health professions’ curricula. Findings indicate that teaching students the process of reflective thinking did enhance learning, but no studies could be found that demonstrated actual changes in clinical behavior or improvement in patient care. The authors highlight the need for future research (i.e., rigorous studies that can evaluate educational strategies that promote reflective thinking).

**Clinical Practice Sites**

In order to attain a safe, beginning level of skill, students must have simulated as well as practical experiences in the cognitive, affective, and psychomotor skills that are relevant to their HOP’s scope of practice. Competency-based education, by its definition, requires that each student receive sufficient opportunities to acquire and demonstrate a basic level of safe practice.

These clinical practice experiences must take place under circumstances in which tutors and preceptors can model the desirable level of safe practice. Elements of this enabling environment include supportive clinical practice guidelines and sufficient client-care resources (e.g., drugs, supplies), and preceptors who demonstrate the desired professional behaviors and safe practice. Another fundamental element of the enabling learning environment is the presence of a sufficient volume of clients who need care related to the task/skill that is to be learned.

Because certain clinical conditions occur less frequently, a wide variety of high-quality clinical settings may be needed to ensure that all students experience the required individual learning opportunities. In addition, a very high volume of students of various HOPs may seek similar experiences simultaneously (particularly in large teaching hospitals).

The standard of care for education would be that all students receive sufficient clinical practice learning opportunities in high-quality clinical learning environments. Although comparative, evaluative studies are not available, a good deal of anecdotal evidence indicates that, in many global settings, implementing programs that conform to this ideal standard presents real challenges to human resource development.
**Varied Clinical Practice Sites**

A BEME systematic review [123] included 73 studies, which yielded 116 outcomes (from 38 studies) that were strong and important enough to be included in the results synthesis. Of these outcomes, 76% were from descriptive studies and 24% from comparative studies. The review focused on the potential impact of early immersion into clinical practice in a wide variety of clinical practice sites. The authors concluded that early experience in clinical sites was motivating for students, helped them be more confident with patients, less stressed, more self-reflective, and enhanced their professional identity. “It strengthened their learning and made it more real and relevant to clinical practice.”

A systematic review examined the impact of early experience in clinical practice to determine its effect on helping medical students develop appropriate attitudes toward their studies and intentions for their future practice [124]. The authors identified 277 educational outcomes from 73 studies, and reported on 116 of those outcomes from 38 studies, which focused on Kirkpatrick evaluation Levels 3 or 4. The authors conclude that early immersion in clinical practice motivated students toward more positive attitudes for study, improved their understanding of subject matter, and improved students’ ability to relate to patients and communicate empathy. Early immersion also changed attitudes toward the discipline of future practice and commitment to serve underserved population groups.

A community-oriented family practice curriculum was compared with a traditional medical curriculum in Iraq [125]. The experimental group (28 students) studied a curriculum that focused on the tasks most often performed by family practice physicians. The comparison group (56 students) studied the traditional curriculum. The comparison indicated that learners involved in the experimental group were very satisfied with the more limited, task-oriented (competency-based) approach, and showed higher learning and clinical skills.

A clinical learning environment inventory [126] was conducted in 14 metropolitan hospitals. Students who were satisfied with their placements indicated that understanding what was expected of them in place and time (“task orientation”) at the clinical site is an important positive attribute.

**Multidisciplinary Learning Experiences**

The literature contains a rich discussion of how educating two or more cadres of health professional students together in the classroom and/or in the clinical setting affects students’ attitudes toward other disciplines, and the learner-based and client-oriented outcomes that might be achieved. Four systematic reviews summarize the findings from 63 of the highest quality studies. These studies evaluate interdisciplinary education covering a wide range of topics and teaching techniques. The multidisciplinary experiences occurred over a time frame from single sessions through whole courses; the majority lasted up to four weeks.

A review [127] uses the Kirkpatrick evaluation framework to categorize findings, which indicate that students found such learning experiences to be highly relevant (Kirkpatrick 1A)—although nurses found the experiences more valuable than did students from other health professions. Several studies indicate a change in attitudes toward professional autonomy and competence (Kirkpatrick 2A). Level 3 evaluations were limited, but studies indicate a positive effect of working and learning together in the clinical environment. The review found the smallest effects for transfer of learning into practice. Very few studies focused on client outcomes.

A systematic review [128], which also uses Kirkpatrick categories, generates some contrary findings. This review finds that student health professionals rated the inter-professional education (IPE) experience very
positively, and expressed more positive attitudes toward other professions or inter-professional teamwork. Inter-professional learning experiences—examined in only six (of 21) studies—demonstrated only modest benefits for students (i.e., students learned to communicate better with one another and with patients). Seven evaluations address service quality improvement initiatives and demonstrate positive findings regarding service delivery. However, these studies are not restricted to pre-service participants. Two studies that do focus strictly on undergraduate IPE conclude that a team education program increased the volume of patients seen (Kirkpatrick 4a) and the comprehensiveness of patient care (Kirkpatrick 4b) by inter-professional undergraduate student teams undertaking community clerkships.

Three sequential reviews that address IPE were examined. Two Cochrane reviews [129], [130] focus on IPE between health and social care professionals. The 2001 search strategy did not generate any usable studies. The 2008 review identified six studies (four RCTs and two controlled before-and-after studies). Of these six studies, four reported positive outcomes at the client level (Kirkpatrick 4b); two of these studies reported that the IPE interventions had no impact on either professional practice or patient care. A more recent review [131] reports on the six studies reviewed in Reeves et al. 2008, and puts these findings in the context of the evolving IPE evidence base.

A quasi-experimental study was undertaken [132] to test an inter-professional educational (medicine, nursing, pharmacy, and physical therapy) intervention that involved 14 different departments in eight Australian universities, and included health care providers and students. The study focuses on an IPE curriculum module and its associated administrative model. Kirkpatrick assessment criteria are used as the evaluation framework. Outcomes indicate that students were satisfied with the learning experience—immediately after completing the module and up to 24 months following (mean score range 1.44 to 1.78, where a score of <2 indicates a high level of satisfaction). Knowledge and understanding of roles and how tasks were shared with a primary care team increased significantly following completion of the module (p < 0.001) (Kirkpatrick 2a). Significant changes were observed in self-rating of perceived ability to collaborate inter-professionally (p = 0.000) (Kirkpatrick 3). The outcome focus at Level 4 was interest in rural work, and findings suggest moderate interest (mean score 2.51 on a six-point scale, where 1 = definite interest).

Lastly, an evaluation [133] summarizes literature in which “learner-based outcomes” are enhanced by at least two health disciplines working together. Thirteen studies were included in the review. Most of these studies used pre-test and post-test controls. Findings indicate positive effects on learners’ attitudes and knowledge. The authors conclude that combined clinical and didactic experiences may produce short-term improvements in learners’ knowledge and attitudes about inter-professional care, but advise that future control group studies should be conducted to explore the outcomes more rigorously and to provide guidance for rapidly changing educational models and clinical practice.

**INFLUENCING FACTORS**

A number of additional factors were examined that may influence students’ opportunity to acquire competence by the time they graduate from the educational environment, and that may then affect students’ ability to translate what they have learned into demonstrated competence in the work setting. These same factors may influence the progression of any individual along the continuum from novice to expert (i.e., from the level of a competent [safe] practitioner to the level of a proficient provider of health care services). However, very few higher tier studies were identified that address these very critical issues (Appendix G). Descriptive and qualitative information frames the majority of findings included in the following discussion.
Regulation

The term “regulation” is used in this discussion, with the caveat that the terminology used within countries for various regulatory approaches varies widely. The purpose of public regulation of HOPs is to protect the consumer public.

The broadest sense of the term regulation, in the context of HOP education and clinical practice, encompasses both voluntary and mandatory processes. The implementation mechanisms for both of these processes are, however, often interchanged at the country level.

For example, accreditation of educational institutions, certification of program graduates, and standards-based reviews of the quality of clinical sites are typically voluntary strategies for quality assessment. On the other hand, establishing laws and statutes that lead to authorization to practice a particular HOP within a country is typically a mandatory process. Many countries use the terms registration, certification, credentialing, or accreditation within this context. Countries may also mandate the “licensure” of an educational or clinical service, which usually implies that the provision of specific services is authorized (e.g., a business license).

Standards Established by Regulatory Bodies/Councils

A descriptive literature review [134] addresses the issues involved in government protection of consumers, particularly in the context of international migration of health professionals (Appendix H). The authors note that the extant literature indicates that significant disparities exist between countries—and even states/provinces within countries—regarding the enforcement of professional regulation. Examples from industrialized nations and a case study depict the similarities and differences between professional regulatory bodies. The authors draw attention to the need for an international oversight body that would serve to introduce a global standard of protection of the public interest.

Practitioner Certification/Registration/Licensure

A literature review [135] addresses international policy concerning professional regulation in nursing and midwifery, but with a particular focus on the various routes of entry into training and pathways to licensure. (Appendix H). The authors specifically question whether nurses should be educated as “generalists” (prepared for a broad scope of nursing practice, on which specialty education can be built) or as “specialists” (e.g., whether the student should exit the undergraduate program as a maternal/child nurse with midwifery skills or as a midwife, without generalist nursing competencies). Case studies of five Western countries indicate no single uniform system of routes of entry into initial training and no overall consensus regarding the optimal model of initial training. The authors question whether country models of regulation designed for developed countries have applicability within wider global settings. They point to the policy debate concerning the academic pathways to licensed practice and note the professional concerns about assuring practice competencies for context-specific care.

The Context of Health Service Delivery

Appropriate Deployment/Assignments

Country human resource projections attempt to allocate educational resources, based on a country’s specific burden of disease. In other words, educational resources should be sufficient to produce enough health practitioners, who have the right skill mix, to address and serve a country’s specific burden of disease, and to serve the care needs of specific patient populations [136] (Appendix G). A Cochrane review [30] explores the effects of pre-licensure health worker education on overall health worker supply. The authors conclude that the evidence is generally insufficient, particularly in low- and middle-income countries. However, promising innovations from a high-income country include providing financial support to health professional students, introducing mechanisms to identify and encourage potential students, and offering support to “at risk”
students (This topic is more fully explored in the sections on “Students” and “Curriculum,” and data are presented in Appendices B and C.)

The degree to which countries can be successful in reaching indicators and targets set for coverage of health services is affected not only by the numbers of practitioners in the country who have been educated in the right skill mix, but also by the degree to which practitioners (including new graduates) are deployed to settings in which this right “skill mix” can be used most effectively in time and place. Descriptive studies abound that describe the adverse impact that arises when human resources are not used in a way that maximizes providers’ highest potential [137]. Many factors may adversely affect HR impact. For example, a delay in the length of time between graduation and deployment to the work environment, or assignments outside the primary focus for which the practitioner has been prepared, can each lead to a loss of competency (sometimes referred to as “de-skilling”).

**Supportive Workplace Environments**

It is intuitively obvious that safe (particularly beginning level) practice can only occur within the context of an enabling environment, which includes—in the context of this discussion—a congruence between an individual practitioner’s level of competence and confidence to perform the assigned duties and functions [138]. In turn, assigned duties and functions must be within the scope of practice of the relevant HOP (the relevant job description).

The preceptorship program is described [139] as a mentored period of time in which new graduates can become acclimated to their new work environment. A program of this type was designed for newly qualified midwives in the UK, so they could receive supportive supervision in both community and facility settings. Midwives valued this period as a time to consolidate their skills and knowledge. Findings of a “satisfaction survey” also indicate that this program had a positive influence on retention rates, which the authors attribute to the feeling by midwives that they were more supported.

**OUTCOMES AND IMPACT**

PSE programs for the HOPs are accountable to the students they educate, to the regulatory body under which they operate, and to the communities that will be served by these programs’ graduates. An article on social accountability and accreditation [140] argues that social, economic, cultural, and environmental determinants of health must guide the strategic development of educational institutions. The graduates these programs produce should possess all the desirable competencies and use them in professional practice. It could also be argued that educational programs have a global accountability, given that they should be responsive to international standards and guidelines, and in light of the international mobility of the health workforce. The expected outcomes and the desired impact of the high-quality health care services offered by graduates are discussed below. Appendices I and J offer summaries of relevant articles.

**Performance Outcomes**

Producing sufficient numbers of various cadres of health workers who have the right mix of skills to address a country’s health care needs is a necessary, but not sufficient means to the end of quality health service delivery. The conceptual model proposes that the health cadres that emerge from quality PSE programs will
demonstrate professional behaviors. Professional behavior implies the highest level of respect and concern for clients as well as sensitivity to a client’s social and emotional needs in the context of a socially, culturally, and racially unbiased approach to serving health care needs [141], [142]. A large body of research—outside the scope of this project—explores the relationship between the delivery of culturally competent care and the reduction of health disparities.

The model also predicates that a competent health workforce will be poised to implement lifesaving practices. Given the realities of limited access to health care facilities and services, and the often life-threatening need for referral to other levels or providers of care, these lifesaving practices can make a fundamental difference for individuals and communities. An exhaustive body of literature—outside the limits of this report—addresses the relationship between continuing professional development (in-service) education programs and improvements in the knowledge and skills of providers. The literature emphasizes, to a degree, skills that enable the provider to deliver proven emergency obstetric and neonatal care interventions that can save the lives of women and children (citations not included). The logic that underpins the relationship between continuing professional development and improved outcomes is likely also applicable within the context of PSE.

A training needs assessment of Lady Health Workers, Lady Health Visitors, and physicians/doctors who provide maternal, neonatal, and child health (MNCH) work in the community was conducted to determine quantitative estimates across various domains of knowledge and skills [143]. These knowledge and skill areas were, at least in theory, taught to these providers during PSE. All cadres demonstrated a lack of knowledge or skills in many of the items necessary to perform MNCH critical resuscitation and immediate newborn care. Only 50% of participants tested were able to demonstrate steps of immediate newborn care. Authors used the findings to influence training needs (PSE and in-service), given that the country has very unfavorable indicators related to MNCH care.

Community Outcomes
A few of the studies included in this review have attempted to address Kirkpatrick’s fourth focus of evaluation (i.e., measureable results of the training program in terms of the health care system, and the proven benefit to client outcomes).

Client Satisfaction
It has been noted that client satisfaction is particularly difficult to assess with any degree of reliability, given that cultural factors may influence attitudes, behaviors, preferences, and treatment expectations in the health care situation. The studies included in the section on “Clinical Practice Sites” in this report offer some discussion of client satisfaction with services delivered by multidisciplinary student learner teams. Client satisfaction is key to service utilization and healthier communities.

Client Healthy Behaviors Increased
A descriptive literature review [144] explores the hypothesized relationship between the preparation of a more culturally diverse dentistry workforce (i.e., recruitment, retention, and graduation of minorities for the profession) and the intended outcome of reduced health disparities. Literature cited in this review indicates that lack of a diverse workforce may foster linguistic and cultural barriers, bias, and clinical uncertainty within the patient-provider relationship. The authors link increased access to dental care and increased use of dental services among clients and providers of similar ethnic identities. This link is an important one, given the relationships between oral health and certain systemic health conditions.
Service Utilization Increased
A study [44]—also discussed in the curriculum section of this report—examines a specific curriculum review and revision that intended to increase access to postabortion care services. A national intervention was implemented to make changes to the undergraduate midwifery curriculum and to enhance teacher and student knowledge and skills in postabortion care, including the use of MVA. Graduates were followed over a three-year period, and a measurable impact on service provision was documented.

Another study [41] compares graduates of a community-based PBL undergraduate curriculum to three prior graduation cohorts of a regular curriculum to determine the degree to which clients utilized the services of these graduates. The PBL graduates showed a statistically significant improvement in mammography screening rates (55 more women screened per 1,000; 95% CI, 10.6–99.3) and continuity of care (3.3% more visits coordinated by the doctor) compared with graduates of the traditional medical curriculum. In addition, PBL graduates were shown to prescribe more by diagnosis than for symptom relief.

Retention of the Workforce
An additional, extensive body of literature—outside the scope of this report—addresses factors that are designed to support and retain health care workers within a specific HOP, and within geographic and practice settings. A specific medical school in Japan had a special mission to produce rural doctors. Students were admitted to the medical school on the basis of rural residence. Graduates were contractually obligated to reside in a rural setting for a period of time (up to nine years), in exchange for a tuition waiver over the six-year undergraduate medical school program. Physicians who had been selectively admitted to this school were followed up [145]. The rural retention rate for students who had a rural upbringing was four times higher than for graduates of other schools. The OR for having a rural address in at least one post-graduation study year was 1.90 (95% CI, 1.04–3.48) for graduates from rural backgrounds.

Health Systems and Health Impact
Quality PSE intends to educate health providers who, working collaboratively, can make a difference in the health systems that they lead and resulting client health outcomes. Health systems outcomes include improved workplace efficiency, commodity management, and a facility environment that is more acceptable to clients in the community. Intended PSE client outcomes include improvements in all dimensions of clients’ quality of life. Some of these improvements will come about by means of reductions in adverse events. For example, consequences of what have been described as the three delays in health service care may be reduced [146]. Addressing these adverse events can lead to reductions in morbidity and mortality.
DISCUSSION

Limitations of This Study

The following limitations apply to the methodology that we selected for this study, and have an impact on the interpretations that can be drawn from our analysis. First, we selected an integrative review of the literature, rather than a meta-analysis or systematic review because the information presented in a majority of the reports did not include all of the information (such as power and ES) required for more rigorous analytical approaches—yet the information that was presented warranted reflection and discussion. (See Box 3.) We adopted a very structured grading method for inclusion or exclusion of articles, and engaged several reviewers in this process. Constraints of time and financial resources were also a consideration in method design.

Commentary

In the literature, discussion of selected topics that contribute to the quality of PSE is very rich. However, discussion of proven linkages between PSE and quality health care service delivery—which is the intended outcome of competency-based education—is not well developed. The research-based evidence already reported in the literature should form the basis of quality PSE programming (the “known knowns” as depicted on the “left side” of the model). The gaps identified in the literature (the “known unknowns”) underpin a research agenda that should be undertaken to advance our knowledge about factors essential to quality PSE, and to address the relationships and linkages between PSE and the health system (the “unknown unknowns”) [147].

Students: In secondary school studies, student selection criteria that predict academic and clinical success include higher academic performance. Older age (post-secondary school) and gender do not contribute to either academic performance or student retention. Rural residence at the time of application is strongly linked to post-graduate selection of rural settings as the site of practice.

Studies of workforce diversity, conducted in Caucasian-majority countries, identify the fact that providing support (a variety of measures are discussed) to students contributes to retention of students (in general) and has a specific positive effect in promoting the retention of students of various ethnic groups. Recruitment and retention of students from a wide variety of ethnic population groups enhances the diversity of the health care workforce. However, little evidence is available to support the impact of such diversification on narrowing health disparities among the populations served by these graduates [148], [144].

Curriculum: Jones et al. [149] speak about recent evolutionary changes in health care service delivery, and the impact of these changes on the curricula for medical (and by extension, all health professional) education. The authors state that the focus of health care has shifted from episodic care of individuals in hospitals to promotion of health in the community. The authors also comment that current practice is less paternalistic, and is now more focused on decisions that are negotiated with clients, based on evidence of effectiveness and safety. Consequently, medical educational methods have also changed. Methods are becoming more student-centered, with an emphasis on active learning rather than on the passive acquisition of knowledge, and on the assessment of clinical competence rather than on the ability to retain and recall unrelated facts.

Although many definitions of competence have been promulgated, no single global definition has been adopted. Without a universally accepted definition, the ability to make equivalent comparisons is limited between and among studies that use competency as an outcome criterion. On the other hand, a common meaning of the term evidence-based practice (EBP) has been widely accepted.
A review of EBP teaching and assessment interventions in health professions [80] examines other systematic reviews of these topics and comments on their findings. The authors report that prior reviews of teaching activities based on EBP conclude that although these teaching methods were able to improve knowledge, attitudes, skills, and behaviors, these methods did not have sustainable impact on EBP behaviors in clinical practice. These authors conclude that, at this point, there is no evidence to establish a link between teaching interventions and an ultimate impact on clinical practice, and advocate for research to craft that link.

Nevertheless—and despite the fact that global consensus on the meaning of competency has not yet been achieved—educators have moved forward to re-design curricula toward that end. Task analysis is one approach that is helping educators to define the elements of a competency-based curriculum [55], [45]. Mulder et al. [150] describe a concept called “entrustable professional activities (EPAs).” In the EPA model, competencies are described in much smaller task units to help curriculum builders identify and select the important, representative or critical tasks that should be mastered as an outcome of the learning process.

A problem-based curriculum design represents a new approach, referred to as the second generation of educational reform in health professional education [7]. Studies that compare PBL to traditional curricula do not provide incontrovertible evidence to favor this design over any other, but these studies also do not dispute the PBL design as a strategy within competency-based learning.

A good deal of progress has been made in developing valid and reliable tools for formative and summative student assessment, to promote and ensure competence at the time of program completion. No studies were identified for this review that compare the competency-based practice of health professionals who received PSE in technical versus baccalaureate degree pathways. One study [151] compares the career trajectories of nurses from two different BA tracks in Israel. No major differences in professional advancement were found between 86 graduates from the university track (which requires passing standard entrance exams) and 114 graduates from the college track (which has less demanding academic admissions requirements).

**Teachers/tutors and preceptors:** The information gathered for this review supports the premise that skillful teachers/tutors—life-long learners who keep current with the science of the subjects they teach, and with the evolving techniques and strategies of contemporary pedagogy—are essential to the effective transmission of knowledge. Retention of that body of highly qualified teachers/tutors is critical to, at minimum, keeping pace with the HOP educational agenda, while simultaneously preparing the next generation of highly qualified educators [152].

Emerson and Records [153] argue that evidence-based education must include the element of scholarship in teaching and learning. These authors contend that the skillful, “scholarly” teacher will instill in students the ability to validate, generate, and apply information that will help them function in a constantly evolving, global health care environment.

Less evidence is available to confirm that the teacher of a health professional discipline must be equally skilled as a classroom teacher and as a clinical preceptor or mentor. The literature points to this position as an ideal [154], but also identifies substantial challenges that are inherent in achieving this dual status. Gillespie and McFetridge [155] discuss the history of the debate about the need for academic teachers who can also serve as clinical mentors. This article describes the gap that widened between the academic and clinical teaching environments when non-academic preceptors were substituted for academic teacher-clinicians in the UK. In another article, that describes the competencies required to teach midwives [156], Thompson argues for the dual role. She states that “competent midwifery teachers must be competent midwifery clinicians for their primary role is to set the boundaries of safety for each level of learner.”
The role of the clinical preceptor or mentor seems to be well understood. This role includes the responsibility to assist with individual student learning needs, to translate components of the academic curriculum into the clinical setting, and to help students make the important link between theory and practice [157].

Administrative leaders in academic as well as in clinical settings must, necessarily, be strongly supportive of their mutual roles and responsibilities. Academic administrators must be cognizant of the impact on the provision of client care that is created when clinical teachers must attend, simultaneously, to the physical, emotional, and learning needs of patients and student learners. Facility administrators must appreciate the value that students add to the clinical setting. The presence of students in the clinic encourages facility providers (staff and preceptors) to update continuously the science that underpins their clinical practice.

**Infrastructure and management:** Extensive experience has led to the understanding that in order to promote student learning and skills acquisition a broad variety of elements is required within the physical environment; however, discussion of the physical learning domain is not well developed in the literature. Several systematic reviews explore the effectiveness of single techniques and approaches. Authors from one study [158] note that, according to the literature, the use of multi-media instruction in health professions education has been a popular pedagogical strategy, which may be equal to or more effective than traditional instructional modalities for attaining knowledge and skills, and for achieving desired performance standards.

**Clinical practice sites:** High-quality evidence confirms that early immersion in a variety of clinical practice sites yields a high impact on students’ perceptions of themselves as future professionals, and confirms their commitment to their chosen profession. Facilitating student placement in a variety of clinical sites requires collaboration and inter-organizational partnerships between the academic and the clinical community—administrators and providers [91].

Several systematic reviews offer modest support for the value of two or more health professions learning together in academic and clinical settings and coming to know the complementary skills and contribution that each offers in health service delivery [159]. The concepts that influence successful inter-professional collaboration include sharing, partnership, power, interdependency, and process [160]. Each element must be balanced between and among participants in the relationship, and this balance can be easily shifted in the direction of dominance by one or more of the partners. The value of inter-professional collaboration was demonstrated in a pre-test/post-test evaluation of a continuing professional development program [161]. One or more of six modules were studied by one or more of 29 members of a HOP. Positive outcomes were demonstrated across all four levels of Kirkpatrick’s evaluative framework, including more efficient and effective referrals of patients (Kirkpatrick 4a, 4b). In 2010, the World Health Organization issued a call to action for developing a collaborative, practice-ready health workforce [162]. The conceptual model developed by WHO depicts IPE and collaborative practice as essential steps on the pathway to optimal health services, strengthened health systems, and improved health outcomes.

**Influencing factors:** There is a limited body of literature that links elements of PSE to the goal of preparing practitioners to produce an adequate supply of health workers with the correct skills mix to address the country’s specific burden of disease. Preparing medical workers for generalist practice in rural and remote settings is the most prominent focus of this discussion. These studies have been conducted in diverse settings around the globe (e.g., the Australian outback, Canadian northern territories, China, Tanzania, and the Democratic Republic of the Congo), which indicates the universality of the challenge. Findings from these studies are consistent in confirming that recruiting students from rural residences, and providing rural clinical immersion experiences, can be very effective in promoting rural practice after graduation. The literature is also
characterized by many descriptive (but few evaluative) studies that discuss the importance of educating non-
physician providers as essential members of the health care workforce [163], [164].

The need to protect the public supports the importance of professional regulation by governmental authorities and by means of professional association self-regulatory mechanisms. However, the literature offers only descriptive information about the manner in which such regulation is designed and implemented, and its effectiveness in achieving its intended outcomes. One would not expect to find RCTs that compare the outcomes of practice between licensed and unlicensed practitioners, given the ethical challenges inherent in such a design. Information about the relationship between engagement in continued professional development activities and subsequent changes in practice knowledge, skills, or behavior is very useful in any discussion about continued competency and re-licensure. However, this body of literature can only offer an indirect (inferential) link between PSE and professional practice.

Nevertheless, some inference about PSE can be drawn from literature that discusses the policy of professional regulation. Dussault [165] focuses on health services delivery systems in low-income countries. In a discussion of the present and future role of the health professions in this context, he remarks that most low-income countries do not have a tradition of labor market regulation, and the professions’ capacity to regulate the health services provided by their members tends to be weak. Dussault states that professions often oppose delegating tasks to lesser-trained workers, resist changes in education and training, and do not invest enough effort in quality assurance. He argues that professions need to engage in a “social contract” with society that fosters access, while retaining quality. Boelen and Woollard [140] also speak of educational programs’ “social accountability.” They argue that health professional educational institutions should seek to justify their investments with evidence of their impact on the public good.

The case study of the national accreditation program established for midwifery education in Afghanistan [166] discusses elements that made the program useful and relevant to the government education and policy sectors, and that served to enhance the quality of programs reviewed under these standards. Components of the program included: a) appropriate policy foundation, b) educational standards, c) tools to assess achievement of these standards, d) technical support to programs to identify gaps and solve problems, and e) a system of official recognition, for informing potential students and the public.

Electronic technologies can change the ways patients get information, the ways governments interact with the professions, and the ways professionals learn. For these reasons regulators and policymakers need to take a new look at several overarching policies in professional regulation [167]. Regulation policies need to be examined to ensure that the language used to define the practice and scope of health professions is consistent and that initial and continuing practice competencies are standardized. These authors argue in favor of creating or recognizing professional credentialing centers that can share the government’s burden of assuring competency. Jordan et al. [168] support this argument by advocating for a forward-looking regulatory system in the context of the nursing profession.

Performance outcomes: No studies were identified that linked elements of quality PSE to the intermediate outcomes predicated in this conceptual model (i.e., lifesaving practices implemented and professional behaviors demonstrated). Many high-quality studies do examine these two outcomes in the context of continuing professional education. The premise of the studies, which assess the effects of training interventions (e.g., those designed to improve skills for implementing maternal and newborn lifesaving skills [169]), is that lack of an adequately trained and competent staff is a key barrier to achieving reductions in morbidity and mortality. Therefore, logically, these critical skills should be taught during PSE, and then sustained through continuing professional development.
Similarly, the foundation for respectful attitudes and ethical behaviors should be laid during the formative professional years. Essential competency lists delineated by professional associations [10], [11] and policy bodies [13], [12], [74] all note that these attitudes and behaviors are fundamental components of PSE programs. Disrespect and abuse by health care service providers violate human and individual rights [170], [171].

**Community outcomes:** Client satisfaction is an outcome assessed in a number of studies of IPE, and these studies generally report positive client responses to receiving team-based care. Similarly, a number of studies that attempt to assess satisfaction with care when the ethnic and cultural backgrounds of clients and providers are more congruent also indicate a trend toward a higher perception of the cultural sensitivity of the provider. In a descriptive literature review [144], Mitchell and Lassiter comment that “the absence of a sound patient-provider relationship is one factor that contributes to disparities in the quality of care received by minority populations.” However, the social desirability response will always introduce a bias into any assessment of this indicator because patients across the globe often express their gratitude for simply having access to any provider or any health care service. Nevertheless, the ideal is that clients are able to distinguish the quality of services offered, and speak up to demand high-quality care of sufficient variety and quantity to meet their personal and community needs.

Educating a sufficient number of health care workers to increase access to care, however, addresses only part of the human resource crisis in many countries. Retaining health practitioners over time (retention within the HOP for which an individual has been educated) and in the communities they serve (geographic distribution) are equally compelling challenges. An impact evaluation and descriptive literature review [172] offers model indicators and methods that have been used to measure the effects of worker retention in rural areas. The authors conclude that the majority of worker retention assessments focus on the physician cadre in English-speaking countries, leaving a critical gap in information about other cadres in global settings. A systematic review of health worker retention [173] identifies seven major motivational themes that affect health worker retention within developing countries: financial rewards, career development, continuing education, hospital infrastructure, resource availability, hospital management, and recognition/appreciation. Two additional systematic reviews confirm the value of these incentives, and add other items for consideration. One review [174] indicates that information and communication technologies added value to incentives used to recruit and retain health workers. Two studies [61], [145] find health worker obligations (e.g., tuition offset schemes) to be of value for retaining workers in rural and remote placements.

A Cochrane review [175] examines the impact of interventions designed to reduce emigration of health care professionals—specifically professionals from low- and middle-income countries (LMICs)—between and among countries. Only one study, which assesses the migration of Philippine nurses to the United States, is included in this review. The authors point to an important gap in knowledge about how effective policy interventions in either high-income countries or LMICs are in regulating (in a positive way) the movement of health professionals from LMICs. These policy interventions are almost exact replicas of those found in the systematic review [173], and include financial rewards, career development and continuing education, improving hospital infrastructure, resource availability, better hospital management, and improved recognition of health professionals.

When striving to achieve the three longer term outcomes that impact community outcomes—satisfaction, service utilization, and client healthy behaviors, it is essential to produce and retain a health workforce. However, the literature does not sufficiently explore these factors as they are linked with PSE.
Health impact: Again, the literature is very rich in reports of the performance and community outcomes of continuing professional education that results in improved knowledge and critical lifesaving skills. For example, a study of emergency skills training for management of shoulder dystocia, conducted among 95 midwives and 45 doctors from six UK hospitals, observed significant improvements in management after training that persisted up to one year after training [176]. A study [169] of lifesaving skills courses conducted in seven sub-Saharan Africa countries for 600 health care professionals (nurse-midwives, doctors, clinical officers, medical specialists) found that participation in the course increased knowledge about the diagnosis and management of complications of pregnancy and childbirth, as well as newborn care (p < 0.001), and fostered measurable improvements in skills (p < 0.001). However, neither of these studies (or many others that could be cited) examine the impact these interventions have on the health system (e.g., reduction in costs for neonatal intensive care services) or on reductions in indicators of morbidity and mortality. A number of studies have predicated the relationship between skilled birth attendance and a trend toward reduction of maternal and neonatal mortality [177], [178], [179]. Again, the logical argument is made that an adequately trained and competent staff, produced by high-quality PSE and sustained by means of continuing professional development activities, is key to achieving reductions in morbidity and mortality.

The team members are aware of a study, recently conducted in Afghanistan. This study measures the relationship between investments made in creating the infrastructure for quality midwifery education, and the changes that resulted from introducing this new provider cadre into the community. Preliminary findings indicate substantially increased health service utilization in provinces that had midwifery schools compared to provinces that did not, as well as very positive outcomes for women, newborns, and families [180]. More studies like this one are needed to examine the relationship between PSE and health service utilization and outcomes.
CONCLUSION

Fauveau, Sherratt, and de Bernis [179] set forth several key areas of work that must be addressed when planning to scale up human resources for maternal health. These authors advise country governments to aim for quality over quantity. They advocate for a concentrated PSE effort that addresses the need to promote or develop: a) high levels of technical competence; b) appropriate curricula that ensure sufficient time for hands-on practical training and that lead to competence and/or proficiency in basic and emergency clinical tasks; c) gender sensitivity; d) excellent interpersonal communication and cultural competencies; and e) motivation for the job.

We provide a conceptual framework for PSE that reflects the investments that countries must make to develop high-quality PSE programs that can lead students to competency for the HOPs—at the time of graduation and entry into the workforce. We urge a parallel and concurrent investment in: a) ongoing monitoring and evaluation of program quality and quality improvement initiatives; b) continuing professional development, to update knowledge and skills of health cadres in an era when science is emerging rapidly, and to sustain health workers’ commitment to life-long learning; and finally, c) longer term basic and operations research designed to demonstrate the value of any country’s investment in PSE. Priority areas for this research are depicted in Appendix K.
Appendix A: Jhpiego Global Learning Strategy—Components of the Vision

Jhpiego’s educational agenda is standards driven:

- Comprehensive quality assurance approaches for pre-service education (PSE) can be used to strengthen accreditation and/or regulation in a country.
- Standards are simplified for widespread, global application.

Jhpiego’s educational approaches include the following elements:

- Simplified educational standards, based on international accreditation standards for ensuring quality
- Pre-service readiness assessments to identify initial gaps in standards
- A flexible technical response tailored to address gaps that have been identified
- A competency-based and performance-focused strategy
- A learner-centric focus, with an emphasis on lifelong learning
- Student-centered learning methods that use technology and self-directed approaches
- Community-based implementation, where appropriate
## Appendix B: Students

<table>
<thead>
<tr>
<th>Author(s) and Year</th>
<th>Country</th>
<th>Student Cadre:</th>
<th>Literature Tier and (Grade)</th>
<th>Kirkpatrick Level</th>
<th>Focus and Summary</th>
</tr>
</thead>
<tbody>
<tr>
<td>Glasser et al. 2008</td>
<td>USA</td>
<td>Medical students T: 661</td>
<td>3 (6)</td>
<td>B</td>
<td>B</td>
</tr>
<tr>
<td>Grumbach and Chen 2006</td>
<td>USA</td>
<td>Medical students T: 661 I: 265 C: 396</td>
<td>2 (4)</td>
<td>B</td>
<td></td>
</tr>
<tr>
<td>Rolfe, Ringland, and Pearson 2004</td>
<td>Australia</td>
<td>Medical students T: 498 I: 344 C: 154</td>
<td>2 (4)</td>
<td>B</td>
<td></td>
</tr>
<tr>
<td>Salvatori 2001</td>
<td>N/A</td>
<td>Health professionals</td>
<td>3 (6)</td>
<td>B</td>
<td></td>
</tr>
<tr>
<td>Cameron, Roxburgh, Taylor, and Lauder 2011</td>
<td>N/A</td>
<td>Nursing and midwifery students N = 15 studies</td>
<td>3 (6)</td>
<td>B</td>
<td></td>
</tr>
<tr>
<td>Author(s) and Year</td>
<td>Country</td>
<td>Student Cadre: T (total) I (intervention) C (comparison or control)</td>
<td>Literature Tier and (Grade)</td>
<td>Kirkpatrick Level</td>
<td>Focus and Summary</td>
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</table>
| Carolan and Kruger 2011 | Australia | Midwifery students T: 32                                             | 3 (7)                       | B                 | **Focus: student support and retention**  
Factors that would increase student retention include: greater opportunities to prepare, more time to study, greater student support, assistance with financial and childcare challenges.                                                                                                                   |
| Fowler and Norrie 2009 | UK      | Nursing and midwifery students T: 35 teachers; 605 students         | 3 (6)                       | B                 | **Focus: student support and retention**  
Regression analysis of findings from an attrition risk prediction tool identified four factors that aided student retention (commitment, understanding of the role, prior educational preparation, financial aid) and four that were associated with students' thoughts of resigning (volume of work, financial burden, lack of understanding of the role, family responsibilities). |
| Greene and Baird 2009   | UK      | Midwifery students T:16                                            | 3 (7)                       | B                 | **Focus: student support and retention**  
A complex variety of reasons lead to withdrawal from studies; no single reason is more compelling.                                                                                                                                                                                                                                           |
| Mulholland et al. 2008 | UK      | Nursing students T: 1,808 (377 withdrawals)                          | 3 (6)                       | B                 | **Focus: student support and retention**  
Logistic regression models were used to identify reasons for withdrawal from undergraduate studies. Males were less likely to complete the program (OR 0.66; 95% CI, 0.48–0.92); older students more likely to finish (26–32 years: OR 1.65; 95% CI, 1.31–3.21; 33 or more years: OR 2.05; 95% CI, 1.31–3.21).                                                               |
| Pariyo et al. 2009     | NA      | Health professionals N = 2 studies                                  | 1 (1)                       | B                 | **Focus: student support and retention**  
Two studies (out of 7,889) reported that an intervention that comprised a package of student support activities (including social, academic, and career guidance and mentorship) resulted in an increase in the number of minority students who enrolled and graduated from health training institutions.                                                                                                   |
<table>
<thead>
<tr>
<th>Author(s) and Year</th>
<th>Country</th>
<th>Student Cadre: T (total) I (intervention) C (comparison or control)</th>
<th>Literature Tier and (Grade)</th>
<th>Kirkpatrick Level</th>
<th>Focus and Summary</th>
</tr>
</thead>
<tbody>
<tr>
<td>Polasek and Kolcic 2006</td>
<td>Croatia</td>
<td>Medical students T: 204</td>
<td>2 (5)</td>
<td>B</td>
<td><strong>Focus: student support and retention</strong> Significant differences were found in academic performance and research involvement for students from urban (higher) compared to rural and remote backgrounds. The latter students had greater academic failure rates.</td>
</tr>
<tr>
<td>Santee and Garavalia 2006</td>
<td>N/A</td>
<td>Nursing students N = 20 studies</td>
<td>1 (1)</td>
<td>B</td>
<td><strong>Focus: student support and retention</strong> Peer tutoring had a positive impact on academic performance, compared to no tutoring. Peer tutoring performed slightly better than faculty tutoring. However, few higher quality studies could be identified for inclusion in the review.</td>
</tr>
<tr>
<td>Valencia-Go 2005</td>
<td>USA</td>
<td>Nursing students</td>
<td>3 (6)</td>
<td>B</td>
<td><strong>Focus: student support and retention</strong> Peer-tutoring, mentoring, advisement, pre-nursing experience seminars, and faculty development predicated likelihood of program completion.</td>
</tr>
</tbody>
</table>
### Appendix C: Curriculum

<table>
<thead>
<tr>
<th>Author(s) and Year</th>
<th>Country</th>
<th>Student Cadre: T (total) I (intervention) C (comparison or control)</th>
<th>Literature Tier and Grade</th>
<th>Kirkpatrick Level</th>
<th>Focus and Summary</th>
</tr>
</thead>
<tbody>
<tr>
<td>Akiode et al. 2010</td>
<td>Nigeria</td>
<td>Midwives T: 6 schools 149 graduates</td>
<td>3 (6)</td>
<td>B  X</td>
<td><strong>Focus: competency-based curriculum</strong> A national intervention was conducted to increase teacher competence and curriculum content in postabortion care. Graduates showed increased knowledge, exposure to, and use of manual vacuum aspiration (MVA) in the workplace.</td>
</tr>
<tr>
<td>Beers 2005</td>
<td>USA</td>
<td>Nursing students N = 54</td>
<td>2 (4)</td>
<td>B</td>
<td><strong>Focus: competency-based curriculum</strong> Problem-based learning (PBL) versus traditional methods of teaching a specific content resulted in no difference in objective test scores.</td>
</tr>
<tr>
<td>Beers and Bowden 2005</td>
<td>USA</td>
<td>Nursing students N = 46</td>
<td>2 (3)</td>
<td>B</td>
<td><strong>Focus: competency-based curriculum</strong> Students involved in a 2005 study were retested (repeated measures) one year post-intervention. Retention of knowledge was higher for PBL participants.</td>
</tr>
<tr>
<td>Butler, Fraser, and Murphy 2008</td>
<td>England</td>
<td>Midwives T: 59 (39 pre-registration students; 20 experienced midwives)</td>
<td>3 (7)</td>
<td>A</td>
<td><strong>Focus: competency-based curriculum</strong> Qualitative study of students, teachers, and practicing midwives generated the perception that the most important requirement at registration is that &quot;a midwife is safe and will practice safely.&quot; However, this capability to be safe is further mediated by attitudes and communication skills.</td>
</tr>
<tr>
<td>Author(s) and Year</td>
<td>Country</td>
<td>Student Cadre: T (total) I (intervention) C (comparison or control)</td>
<td>Literature Tier and (Grade)</td>
<td>Kirkpatrick Level</td>
<td>Focus and Summary</td>
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<td>Crandall et al. 2007</td>
<td>USA</td>
<td>Medical students T: 110 I: 24 C: 86</td>
<td>2 (3)</td>
<td>B</td>
<td><strong>Focus: competency-based curriculum</strong> Students from PBL and traditional curriculum cohorts were compared to determine their attitudes toward providing care for medically indigent patients. The study also analyzed data by gender. Attitudes were less favorable over time from admission to graduation, but did not differ as a function of curriculum or gender.</td>
</tr>
<tr>
<td>Frank et al. 2010</td>
<td>NA</td>
<td>Health professions N = 82 studies</td>
<td>1 (1)</td>
<td>B</td>
<td><strong>Focus: competency-based curriculum</strong> Systematic review of the meaning of the term competency-based education (CBE) identified four major themes: a) organizing framework; b) rationale; c) contrast with time; d) implementing CBE.</td>
</tr>
<tr>
<td>Jayasekara, Schultz, and McCutcheon 2006</td>
<td>N/A</td>
<td>Nursing students N = 16 studies</td>
<td>1 (1)</td>
<td>B</td>
<td><strong>Focus: competency-based curriculum</strong> Evaluated four stated models for nursing undergraduate curriculum design: integrated, subject-centered, problem-based, and critical thinking. Too little data were available to support any of the designs.</td>
</tr>
<tr>
<td>Jones and Johnston 2006</td>
<td>Scotland</td>
<td>Nursing students T: 447</td>
<td>3 (6)</td>
<td>A</td>
<td><strong>Focus: competency-based curriculum</strong> Compared traditional versus PBL student cohorts. PBL students reported fewer academic, clinical, and personal worries; however, they scored lower on certain assessment measures.</td>
</tr>
<tr>
<td>Author(s) and Year</td>
<td>Country</td>
<td>Student Cadre: T (total) I (intervention) C (comparison or control)</td>
<td>Literature Tier and (Grade)</td>
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<tr>
<td>Tamblyn et al. 2005</td>
<td>Canada</td>
<td>Medical students T: 751 I: 151 C: 600</td>
<td>2 (4)</td>
<td>4</td>
<td><strong>Focus: competency-based curriculum</strong> Medical graduates who had studied within a traditional curriculum (3 cohorts) were compared to graduates of a PBL-focused curriculum (1 cohort). Annual performance in preventive care, continuity of care, diagnosis, and management were significantly higher for the PBL cohort.</td>
</tr>
<tr>
<td>Thomas [A Udaya] et al. 2011</td>
<td>Liberia</td>
<td>T: 165 46 midwives 119 graduates (6 months to 2 years)</td>
<td>3 (6)</td>
<td>A</td>
<td><strong>Focus: competency-based curriculum</strong> Task analysis was conducted among recent graduates to affirm the knowledge and skills they use on the job, in order to inform curriculum changes for PSE to prepare graduates to implement these tasks.</td>
</tr>
<tr>
<td>Uys et al. 2004</td>
<td>South Africa</td>
<td>Nursing school graduates N = 49</td>
<td>3 (7)</td>
<td>B</td>
<td><strong>Focus: competency-based curriculum</strong> Students who used a PBL approach were graded higher than non-PBL students on problem-solving skills.</td>
</tr>
<tr>
<td>Williams and Beattie 2008</td>
<td>N/A</td>
<td>Health professionals N = 56 studies</td>
<td>1 (1)</td>
<td>B</td>
<td><strong>Focus: competency-based curriculum</strong> Explored PBL as a curriculum strategy in the clinical (not academic) setting—little evidence found in support or opposition; PBL as a method is not well understood by clinicians.</td>
</tr>
<tr>
<td>Author(s) and Year</td>
<td>Country</td>
<td>Student Cadre: T (total) I (intervention) C (comparison or control)</td>
<td>Literature Tier and (Grade)</td>
<td>Kirkpatrick Level</td>
<td>Focus and Summary</td>
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</tbody>
</table>
| Brosnan, Evans, Brosnan, and Brown 2006 | Ireland  | Nursing students                                                   | 3 (7)                      | A,B               | **Focus: formative student assessments**  
The process and outcomes of a newly implemented objective structured clinical examination (OSCE) process were evaluated. Findings indicate that OSCE was perceived to be a meaningful and fair form of assessment; students indicated that they felt more prepared for and more confident about forthcoming placements. |
| Fullerton and Ingle 2003            | USA      | N/A                                                                | 3 (6)                      | B                 | **Focus: formative student assessments**  
Approaches to evaluation/feedback for students who study via distance methods are discussed.                                                                                       |
| Maize et al. 2010                  | NA       | Pharmacy and other professions N/A                                | 3 (6)                      | B                 | **Focus: formative student assessments**  
Remediation policies should include early detection of problems in academic performance as well as strategies to help students develop better approaches for academic success and to facilitate self-directed learning. |
| Norman et al. 2002                 | NA       | Nursing and midwifery students T: 300 (257 nurses; 43 midwives)   | 3 (6)                      | X                 | **Focus: formative student assessments**  
Validity and reliability of clinical assessment tools indicate that multiple means and methods are required to document competency.                                                                 |
| Rushforth 2007                     | NA       | N/A N of studies not reported                                     | 3 (6)                      | B                 | **Focus: formative student assessments**  
Descriptive literature review of studies about OSCE; finding that validity and reliability of new OSCE exams—as well as length, number, and interdependence of the stations—must be carefully considered. |
<table>
<thead>
<tr>
<th>Author(s) and Year</th>
<th>Country</th>
<th>Student Cadre: T (total) I (intervention) C (comparison or control)</th>
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<th>Kirkpatrick Level</th>
<th>Focus and Summary</th>
</tr>
</thead>
<tbody>
<tr>
<td>Walsh, Bailey, and Koren 2009</td>
<td>N/A</td>
<td>Nursing N = 41 studies</td>
<td>1 (1)</td>
<td>B</td>
<td><strong>Focus: formative student assessments</strong> Integrative literature review indicates that OSCE process is capable of measuring competence; however, major gaps exist in the discussion of psychometric properties of these tools.</td>
</tr>
<tr>
<td>Watson, Stimpson, Topping, and Porock 2002</td>
<td>N/A</td>
<td>Nursing students N = 197 studies</td>
<td>1 (1)</td>
<td>X</td>
<td><strong>Focus: summative student assessments</strong> This systematic review of the literature determines that consensus on the definition of competence must first be reached, before assessment tools can be defined.</td>
</tr>
<tr>
<td>Yanhua and Watson 2011</td>
<td>N/A</td>
<td>Nursing students N = 23 studies</td>
<td>1 (1)</td>
<td>B</td>
<td><strong>Focus: summative student assessments</strong> This systematic review focuses on studies conducted in the interim since the prior review (Watson, Stimpson, Topping, and Porock 2002). The authors conclude that the definition of competence is still elusive at the global level.</td>
</tr>
<tr>
<td>Curran and Rourke 2004</td>
<td>Canada</td>
<td>Physicians N/A</td>
<td>3 (6)</td>
<td>B</td>
<td><strong>Focus: curriculum aligned with national health priorities</strong> Undergraduate medical education factors found to influence selection of rural settings included recruitment of students from those settings, expression of values and attitudes toward rural practice as a choice, undergraduate rural-practice learning experiences.</td>
</tr>
<tr>
<td>Eley and Baker 2006</td>
<td>Australia</td>
<td>Medical students</td>
<td>3 (6)</td>
<td>B</td>
<td><strong>Focus: curriculum aligned with national health priorities</strong> Rural clinical school placements for medical students increased interest in rural practice settings, but did not increase selection of rural settings for internships.</td>
</tr>
<tr>
<td>Author(s) and Year</td>
<td>Country</td>
<td>Student Cadre: T (total) I (intervention) C (comparison or control)</td>
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</table>
| Glasser et al. 2008 | USA     | Medical students T: 216                                      | 3 (6)                       | B                | **Focus: curriculum aligned with national health priorities**  
Medical students are recruited from rural settings and are immersed in a rural-focused curriculum. These rural students scored slightly lower on medical school admission test scores, but equally well on licensure examinations. A total of 64% of graduates chose primary care practice in small towns and/or rural communities. |
| Kaye, Mwanika, and Sewankambo 2010 | Uganda | Medical students T: 60 I: 30 C: 30                           | 2 (4)                       | B                | **Focus: curriculum aligned with national health priorities**  
Students who completed a PBL curriculum, including experiential training in rural health settings, were compared to a cohort who graduated from a traditional curriculum. The PBL experience significantly influenced the choice to work in a rural/underserved area. |
| Laven and Wilkinson 2003 | N/A     | Medical students N = 12 studies                              | 3 (6)                       | B                | **Focus: curriculum aligned with national health priorities**  
A systematic review addressed the effect of rural background on willingness to enter rural practice. A strong association was identified, with ORs exceeding 2.0. Rural undergraduate training had a similar positive influence. |
<table>
<thead>
<tr>
<th>Author(s) and Year</th>
<th>Country</th>
<th>Student Cadre:</th>
<th>Literature Tier and Grade</th>
<th>Kirkpatrick Level</th>
<th>Focus and Summary</th>
</tr>
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<tbody>
<tr>
<td>Leon and Riise Kolstad</td>
<td>Tanzania</td>
<td>Medical students T: 130</td>
<td></td>
<td></td>
<td><strong>Focus: curriculum aligned with national health priorities</strong>&lt;br&gt;Regression analysis indicates that the following factors inhibit medical students’ interest in work in rural settings: lack of a primary interest in medicine, not having studies in rural clinical curricula, preference for specialization. Authors suggest the need to re-exam admission policies.</td>
</tr>
<tr>
<td>2010</td>
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<tr>
<td>Longombe 2009</td>
<td>DR Congo</td>
<td>Medical school graduates T: 163</td>
<td></td>
<td></td>
<td><strong>Focus: curriculum aligned with national health priorities</strong>&lt;br&gt;Graduates of a rural medical school were compared to graduates of an urban school. Of graduates from the rural school, 97.7% were employed in the province in which they trained, the majority (81.4%) in rural areas. Urban graduates dispersed, but only 23.7% to rural areas.</td>
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<td></td>
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<td>I: 43</td>
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<td></td>
<td></td>
<td>C: 120</td>
<td></td>
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<tr>
<td>Mathews, Rourke, and Park</td>
<td>Canada</td>
<td>Medical students T: 248</td>
<td></td>
<td></td>
<td><strong>Focus: curriculum aligned with national health priorities</strong>&lt;br&gt;Retrospective analysis of factors predictive of selection of rural practice sites indicates that those with a rural background were more likely to practice in rural Newfoundland and Labrador (OR 1.95; 95% CI, 1.38–2.86).</td>
</tr>
<tr>
<td>2008</td>
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<tr>
<td>Matsumoto, Inoue, and Kajii</td>
<td>Japan</td>
<td>Medical students T: 1,929</td>
<td></td>
<td></td>
<td><strong>Focus: curriculum aligned with national health priorities</strong>&lt;br&gt;Students selectively admitted from rural backgrounds were likely to practice in those settings.</td>
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<tr>
<td>2008a</td>
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<td>Author(s) and Year</td>
<td>Country</td>
<td>Student Cadre: T (total) I (intervention) C (comparison or control)</td>
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<tr>
<td>McDonnel Smedts and Lowe 2007</td>
<td>Australia</td>
<td>Physicians T: 452</td>
<td>2 (4)</td>
<td>B</td>
<td><strong>Focus: curriculum aligned with national health priorities</strong> Enrollment quotas for admission of ethnic and indigenous minorities were an effective way of retaining graduates in those settings. This study focused on the Northern Territories of Australia.</td>
</tr>
<tr>
<td>Rabinowitz, Diamond, Markham, and Wortman 2008</td>
<td>N/A</td>
<td>Medical students N = 10 studies</td>
<td>1 (1)</td>
<td>B</td>
<td><strong>Focus: curriculum aligned with national health priorities</strong> Comprehensive medical school rural programs have produced a multifold increase in the rural physician supply. Widespread replication of these programs could double the current estimates of rural doctors for the next decade.</td>
</tr>
<tr>
<td>Shannon et al. 2005</td>
<td>USA</td>
<td>Medical students T: 1,360</td>
<td>3 (6)</td>
<td>A, B</td>
<td><strong>Focus: curriculum aligned with national health priorities</strong> Students who completed a required three-month rotation in a rural setting were assessed. Students who rated smaller town practice highly were more likely (p &lt;0.01) to say they had a rural hometown and that they anticipated practice in a primary care setting.</td>
</tr>
<tr>
<td>Tavernier, Connor, Gates, and Wan 2003</td>
<td>USA</td>
<td>Medical residents T: 775</td>
<td>3 (6)</td>
<td>B</td>
<td><strong>Focus: curriculum aligned with national health priorities</strong> National survey of family planning residents indicates that factors influencing choice of practice location in medically underserved areas (MUAs) are related to personal or professional experience in those areas.</td>
</tr>
<tr>
<td>Author(s) and Year</td>
<td>Country</td>
<td>Student Cadre: T (total) I (intervention) C (comparison or control)</td>
<td>Literature Tier and (Grade)</td>
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<td>Focus and Summary</td>
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<tr>
<td>Urbina et al. 2003</td>
<td>USA</td>
<td>Medical students T: 515 I: 249 C: 221</td>
<td>2 (4)</td>
<td>B</td>
<td>Focus: curriculum aligned with national health priorities A primary care curriculum (PCC) using a PBL learning model and incorporating a community preceptorship was compared to a traditional curriculum. Slightly more (40%) of the 249 graduates of this PCC/PBL curriculum chose to practice in the state, compared to 32% of the traditional students; and of those graduates practicing in the state, 23% of the PCC/PBL students practice primary care, compared to 16% of the traditional students.</td>
</tr>
<tr>
<td>Wang 2002</td>
<td>China</td>
<td>Medical students T: 24 schools I: 10 C: 12</td>
<td>3 (6)</td>
<td>B</td>
<td>Focus: curriculum aligned with national health priorities Studying medicine in a rural location has been shown to increase the retention of rural physicians. This study compared medical schools located in rural areas to those located in metropolitan areas to determine which schools provide rural physicians. Although all rural medical schools produced rural physicians, data were confirmed for only one of these schools (34% of this school’s graduates entered rural practice). Only two of the 12 metropolitan schools reported producing any rural physicians.</td>
</tr>
<tr>
<td>Author(s) and Year</td>
<td>Country</td>
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<td>Literature Tier and (Grade)</td>
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<tr>
<td>Wilkinson, Laven, Pratt, and Beilby 2003</td>
<td>Australia</td>
<td>General practitioners T: 2,414</td>
<td>3 (6)</td>
<td>B</td>
<td><strong>Focus: curriculum aligned with national health priorities</strong>&lt;br&gt;Undergraduate medical school factors that influenced choice of rural placement included rural undergraduate training (OR 1.61) compared to urban, and pre-admission residence in a rural area (OR 3.18).</td>
</tr>
<tr>
<td>Wong et al. 2010</td>
<td>N/A</td>
<td>Medical students and graduates N = 41 studies</td>
<td>1 (1)</td>
<td>A, B</td>
<td><strong>Focus: curriculum aligned with national health priorities</strong>&lt;br&gt;Curricula that contain specific content on quality improvement and patient safety usually improve learners' knowledge and frequently result in changes in clinical processes.</td>
</tr>
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</table>
## Appendix D: Teachers/Tutors/Preceptors

<table>
<thead>
<tr>
<th>Author(s) and Year</th>
<th>Country</th>
<th>Student Cadre: T (total) I (intervention) C (comparison or control)</th>
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<th>Focus and Summary</th>
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<tbody>
<tr>
<td>Johnsen, Aasgaard, Wahl, and Salminen 2002</td>
<td>Norway</td>
<td>Nurse faculty T: 348</td>
<td>3 (6)</td>
<td>B</td>
<td><strong>Focus: teachers/tutors competent in technical areas</strong> Competencies requisite to good teaching were identified through a population-based study. The most important domains include the ability to encourage students to combine theory and practice (mean 3.91 on four-point scale) and having a high regard for clinical skills (mean 3.76). Five domains are explored.</td>
</tr>
<tr>
<td>Steinert et al. 2006</td>
<td>N/A</td>
<td>Health professional faculty N = 53 studies</td>
<td>1 (1)</td>
<td>A,B</td>
<td><strong>Focus: teachers/tutors competent in classroom teaching</strong> Faculty development activities are highly valued, and lead to learning and behavior change, as well as better teaching performance.</td>
</tr>
<tr>
<td>Thomas, Saroyan, and Dauphinee 2011</td>
<td>N/A</td>
<td>Health professional faculty N/A</td>
<td>3 (6)</td>
<td>B</td>
<td><strong>Focus: teachers/tutors competent in clinical teaching</strong> This descriptive literature review explores what is known about evidence-based practice (EBP), and the role of academic educators in its implementation.</td>
</tr>
<tr>
<td>Williams and Taylor 2008</td>
<td>UK</td>
<td>Nursing students T: 11</td>
<td>3 (7)</td>
<td>A</td>
<td><strong>Focus: clinically competent teachers/tutors</strong> Qualitative study of perceptions and experiences of undertaking clinical practice while primarily serving as educator. Alternative definitions of clinical practice suggested by respondents included research and supervision of students.</td>
</tr>
<tr>
<td>Author(s) and Year</td>
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</table>
| Carlisle, Calman, and Ibbotson 2009 | Scotland | Nursing and midwifery T: 165 participants in one or more of four study approaches | 2 (4) 3 (6) | B | Focus: competent preceptors  
Practice Education Facilitators work throughout the country to provide support to mentors who monitor the clinical learning of students. Mixed method study identified important factors as facilitators or barriers to effective student/mentor/preceptor relationship. |
| Kaviani and Stillwell 2000 | N/A | Nursing students T: 13 students; 2 nurse managers; 6 preceptors | 3 (7) | B | Focus: competent preceptors  
A qualitative study teased out the elements necessary and desirable in those who serve as preceptors, and identified facilitators and barriers to implementing the role of preceptor in the clinical setting. |
| Sheehan and Jansen 2006 | New Zealand | Health professionals N = 13 graduates | 3 (7) | B | Focus: competent preceptors  
Qualitative study of 13 participants in a joint teaching/learning program among Maori and non-Maori teachers helped each culture understand the other, and helped advance clinical leadership skills of Maori as teachers. |
| Udlis 2008 | N/A | Nursing students N = 16 studies | 1 (1) | A,B | Focus: competent preceptors  
An Integrative review indicates that participation in a (one-to-one) preceptorship program increased role conception and performance. However, no evidence was found that preceptorship promoted critical thinking, clinical competence, or improvement licensing examination (National Council Licensure Examination-Registered Nurse [NCLEX-RN]) pass rates. |
<table>
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<tr>
<th>Author(s) and Year</th>
<th>Country</th>
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<th>Kirkpatrick Level</th>
<th>Focus and Summary</th>
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</thead>
</table>
| Bos, Loftmark, and Tornkvist 2009      | Norway  | Nurses         | T: 182 I: 98 C: 84       | 2 (4) B           | Focus: academic and clinical teaching linkages  
A survey among district nurses (DNs), who served as mentors/preceptors to students, was conducted to investigate DNs’ experience of supervising nursing students before and after implementation of a new supervision model. This survey identified areas that needed improvement, including opportunities to keep up to date with changes in nurse education programs, support from the university and from clinic managers, and setting aside time for supervision. Implementation of the new supervision model with improved linkages resulted in some improvements. |
| Brown, White, and Leibbrandt 2006      | N/A     | Nurses         |                           | 3 (6) B           | Focus: academic and clinical teaching linkages  
A review of the business literature generates characteristics of sound partnerships to inform nurse administrators and faculty how to craft stronger linkages. A set of best practice guidelines is offered. |
| Casey 2010                             | Ireland | N/A            |                           | 3 (6) B           | Focus: academic and clinical teaching linkages  
To facilitate student learning and reduce theory/practice gap, seven key elements of a framework for inter-professional relationships were identified as essential components of collaborative partnerships between universities and hospitals. |
## Appendix E: Infrastructure and Management

<table>
<thead>
<tr>
<th>Author(s) and Year</th>
<th>Country</th>
<th>Student Cadre: T (total) I (intervention) C (comparison or control)</th>
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<td></td>
<td></td>
<td></td>
<td>1 Reaction</td>
<td>2 Learning</td>
<td>3 Behavior</td>
</tr>
</tbody>
</table>
| Ainsley and Brown 2009 | N/A    | Nursing                                                      | 3 (6)                       | A,B               | B                 | Focus: enhanced learning approaches  
A literature review identifies advantages of incorporating informatics and online teaching/learning methods to achieve learner satisfaction and desired learning outcomes. The authors recognize that there are distinct challenges to assessing psychomotor skills in online learning environments. |
| Bernard et al. 2004 | N/A    | Multiple disciplines N = 22 studies                           | 1 (1)                       | A,B               | A,B               | Focus: enhanced learning approaches  
Distance education modalities may outperform classroom modalities for teaching; synchronous activities favored classroom instruction, while asynchronous activities favored distance education. |
| Buckley et al. 2009 | UK      | Health professions N = 69 studies                             | 1 (1)                       | B                 | A,B               | Focus: enhanced learning approaches  
Portfolios improve knowledge and understanding (including the ability to integrate theory with practice), and increase self-awareness and reflection. |
| Cook et al. 2008   | N/A    | Health professions N = 201 studies                            | 1 (1)                       | B                 | B                 | Focus: enhanced learning approaches  
Internet-based education was compared to no intervention and to non-Internet methods. Data synthesis shows that Internet-based learning—when compared with no intervention—is associated with large positive effects, but the effectiveness of Internet-based learning appears to be similar to that of traditional methods. |
<table>
<thead>
<tr>
<th>Author(s) and Year</th>
<th>Country</th>
<th>Student Cadre: T (total) I (intervention) C (comparison or control)</th>
<th>Literature Tier and (Grade)</th>
<th>Kirkpatrick Level</th>
<th>Focus and Summary</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cook et al. 2010</td>
<td>N/A</td>
<td>Health professions N = 51 studies</td>
<td>1 (1)</td>
<td>B</td>
<td>Focus: enhanced learning approaches Interactivity, practice exercises, repetition, and feedback were associated with improved learning outcomes. However, much inconsistency was found across studies.</td>
</tr>
<tr>
<td>Cook et al. 2011</td>
<td>N/A</td>
<td>Health professions N = 609 studies</td>
<td>1 (1)</td>
<td>B</td>
<td>Focus: enhanced learning approaches This review included 137 randomized studies, 67 two-group comparisons, and 405 pre-test/post-test studies. The review concluded that—compared with no intervention—technology-enhanced simulation training in health professions education is consistently associated with large effects for outcomes of knowledge, skills, and behaviors and moderate effects for patient-related outcomes.</td>
</tr>
<tr>
<td>Cook, Levinson, and Garside 2010</td>
<td>N/A</td>
<td>Health professions N = 20 studies</td>
<td>1 (1)</td>
<td>A</td>
<td>Focus: enhanced learning approaches Internet-based learning required more time, but led to higher satisfaction and increased knowledge (compared to other instruction) when feedback and interactivity were built into the instruction.</td>
</tr>
<tr>
<td>Cook and Triola 2009</td>
<td>NA</td>
<td>Not reported</td>
<td>3 (6)</td>
<td>B</td>
<td>Focus: enhanced learning approaches Virtual patients, a form of simulation, are useful in increasing clinical reasoning. The literature on this topic is underdeveloped (mostly qualitative or descriptive).</td>
</tr>
<tr>
<td>Author(s) and Year</td>
<td>Country</td>
<td>Student Cadre: T (total) I (intervention) C (comparison or control)</td>
<td>Literature Tier and (Grade)</td>
<td>Kirkpatrick Level</td>
<td>Focus and Summary</td>
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<tr>
<td>Dearnley, Haigh, and Fairhall 2008</td>
<td>N/A</td>
<td>Midwifery students and faculty T: 34 (29 students, 5 teachers)</td>
<td>3 (7)</td>
<td>A</td>
<td>Focus: enhanced learning approaches Use of mobile technology (pocket personal computers) was well received by students as an adjunct to reporting and recording.</td>
</tr>
<tr>
<td>Farmer et al. 2008</td>
<td>NA</td>
<td>Health professionals N = 23 studies</td>
<td>1 (1)</td>
<td>X</td>
<td>Focus: enhanced learning approaches Printed educational materials provided to learners (both pre-service education [PSE] and continuing professional education [CPE]), compared to no intervention, led to changes in how providers conducted clinical practice (e.g., reduction in cesarean section following exposure to educational materials about risks and benefits).</td>
</tr>
<tr>
<td>Issenberg et al. 2005</td>
<td>N/A</td>
<td>Health professionals N = 109 studies</td>
<td>1 (1)</td>
<td>A</td>
<td>Focus: enhanced learning approaches A systematic review indicates that use of high-fidelity simulators facilitates student learning, under the right circumstances. Ten learning enhancement features characteristic of simulation are identified.</td>
</tr>
<tr>
<td>Jwayyed et al. 2011</td>
<td>N/A</td>
<td>Health professionals N = 187 studies</td>
<td>3 (6)</td>
<td>B</td>
<td>Focus: enhanced learning approaches Technology-assisted education was superior to traditional methods in 42 of 64 direct comparison articles; however, a “best method” could not be identified.</td>
</tr>
<tr>
<td>Author(s) and Year</td>
<td>Country</td>
<td>Student Cadre: T (total) I (intervention) C (comparison or control)</td>
<td>Literature Tier and (Grade)</td>
<td>Kirkpatrick Level</td>
<td>Focus and Summary</td>
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<tr>
<td>Mann, Gordon, and MacLeod 2009</td>
<td>N/A</td>
<td>Health professionals N = 29 studies</td>
<td>1 (1)</td>
<td>B X B</td>
<td>Focus: enhanced learning approaches A systematic review demonstrated that when reflective thinking is taught in PSE, it is retained in clinical practice. Findings from a systematic review indicate that reflection appears to help practitioners make meaning of complex situations and enables practitioners to learn from experience. However, no studies demonstrated/measured actual change in clinical behavior or improved patient care.</td>
</tr>
<tr>
<td>May, Park, and Lee 2009</td>
<td>N/A</td>
<td>Health professions N = 95 studies</td>
<td>1 (1)</td>
<td>A B X</td>
<td>Focus: enhanced learning approaches This literature review found that using standardized patients had a positive effect on enhancing students’ learning experience. However, most studies used weaker research designs (only three RCTs). Students were satisfied (Kirkpatrick 1), had more confidence and knowledge (Kirkpatrick 2), and increased skill (Kirkpatrick 3) in the specific procedure being taught.</td>
</tr>
<tr>
<td>McMullan et al. 2003</td>
<td>NA</td>
<td>Health professionals N = 72 studies</td>
<td>3 (6)</td>
<td>B A,B</td>
<td>Focus: enhanced learning approaches Portfolios reflect the educational theory of adult learning, and can be useful in identifying the development of reflection, which has been determined to be an essential component of professional development.</td>
</tr>
<tr>
<td>Author(s) and Year</td>
<td>Country</td>
<td>Student Cadre: T (total) I (intervention) C (comparison or control)</td>
<td>Literature Tier and Grade</td>
<td>Kirkpatrick Level</td>
<td>Focus and Summary</td>
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<tr>
<td>Murad et al. 2010</td>
<td>N/A</td>
<td>Health professionals N = 59 studies</td>
<td>1 (1)</td>
<td>A, B</td>
<td>Focus: enhanced learning approaches Self-directed learning was associated with a moderate increase in knowledge, and with a non-significant increase in attitudes and skills. The method worked better when selected by students and when used for more advanced students.</td>
</tr>
<tr>
<td>Nartker et al. 2010</td>
<td>Tanzania</td>
<td>Health professionals N = 25 programs</td>
<td>3 (6)</td>
<td>A, B</td>
<td>Focus: enhanced learning approaches Use of the Internet increased opportunities to educate students in the community; however, given resource and infrastructure constraints, a blended, print-based distance learning model is most feasible.</td>
</tr>
<tr>
<td>Reilly and Spratt 2007</td>
<td>Tasmania</td>
<td>Nursing students T: 41</td>
<td>3 (6,7)</td>
<td>A</td>
<td>Focus: enhanced learning approaches Students who used patient simulators prior to clinical practice were more confident and competent.</td>
</tr>
<tr>
<td>Rzymski et al. 2006</td>
<td>Poland</td>
<td>Midwifery students T:180</td>
<td>3 (6)</td>
<td>B</td>
<td>Focus: enhanced learning approaches Use of the medical Internet was correlated with high self-evaluation of search skills ($r = 0.20$, $p = 0.016$). The Internet was a secondary source of information, following classroom information and medical texts.</td>
</tr>
<tr>
<td>Secomb 2008</td>
<td>NA</td>
<td>Health professionals N = 12 studies</td>
<td>1 (1)</td>
<td>A, B</td>
<td>Focus: enhanced learning approaches Peer teaching influenced students’ learning in cognitive and psychomotor domains and increased students’ confidence in clinical practice.</td>
</tr>
<tr>
<td>Author(s) and Year</td>
<td>Country</td>
<td>Student Cadre: T (total) I (intervention) C (comparison or control)</td>
<td>Literature Tier and (Grade)</td>
<td>Kirkpatrick Level</td>
<td>Focus and Summary</td>
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<tr>
<td>Van Moorsel 2005</td>
<td>USA</td>
<td>Multidisciplinary T: 227 I: 179 C: 48</td>
<td>2 (4)</td>
<td>2 Learning</td>
<td>Focus: enhanced learning approaches Library-sponsored literature search classes improved the skills of participants (p &lt; 0.001) to acquire and retain literature-searching skills.</td>
</tr>
</tbody>
</table>
### Appendix F: Clinical Practice Sites

<table>
<thead>
<tr>
<th>Author(s) and Year</th>
<th>Country</th>
<th>Student Cadre: T (total) I (intervention) C (comparison or control)</th>
<th>Literature Tier and (Grade)</th>
<th>1 Reaction</th>
<th>2 Learning</th>
<th>3 Behavior</th>
<th>4 Outcome</th>
<th>Focus and Summary</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cooper , Carlisle, Gibbs, and Watkins 2001</td>
<td>N/A</td>
<td>Health professionals N = 30 studies</td>
<td>1 (1)</td>
<td>A, B</td>
<td>A, B</td>
<td>X</td>
<td>Focus: multidisciplinary learning experiences</td>
<td>A systematic review found that multi-professional education in health professions had positive effects on student knowledge, skills, attitudes, and beliefs. But no discernible effects on clinical practice were found.</td>
</tr>
<tr>
<td>Hammick et al. 2007</td>
<td>N/A</td>
<td>Health professionals N = 21 studies</td>
<td>1 (1)</td>
<td>A, B</td>
<td>A, B</td>
<td>X</td>
<td>Focus: multidisciplinary learning experiences</td>
<td>Inter-professional education and clinical care are well received, and positively influence knowledge and skills; however, these experiences are less likely to influence positive attitudes and perceptions toward others on the service delivery team.</td>
</tr>
<tr>
<td>McNair, Stone, Sims, and Curtis 2005</td>
<td>Australia</td>
<td>Health professionals T: 91</td>
<td>2 (4)</td>
<td>A</td>
<td>A, B</td>
<td></td>
<td>Focus: multidisciplinary learning experiences</td>
<td>Inter-disciplinary learning teams were highly satisfied with the experience, and they learned to value collaborative skills.</td>
</tr>
<tr>
<td>Author(s) and Year</td>
<td>Country</td>
<td>Student Cadre: T (total) I (intervention) C (comparison or control)</td>
<td>Literature Tier and (Grade)</td>
<td>Kirkpatrick Level</td>
<td>Focus and Summary</td>
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</table>
| Reeves et al. 2008                | N/A     | Health and social care professionals N = 6 studies                  | 1 (1)                      | A,B,A,B          | **Focus: multidisciplinary learning experiences**  
The small sample size yielded no generalizable results; however, four of six studies produced positive outcomes (e.g., in patient satisfaction and in better clinical care) when inter-professional education (IPE) was offered among health and social care professionals.                                                                                     |
| Reeves et al. 2010                | N/A     | Health and social care professionals N = 6 studies                  | 1 (1)                      | A,B,A,B          | **Focus: multidisciplinary learning experiences**  
This article, which reports on the six studies examined in Reeves et al. 2008, recognizes the range of positive IPE outcomes found in four of those six studies, and encourages continued strengthening of studies to ensure that they can provide comprehensive insights into the effects of IPE.                                                                                              |
| Remington, Foulk, and Williams 2006 | N/A     | Health professionals N = 13 studies                                 | 3 (6)                      | A,B,A,B          | **Focus: multidisciplinary learning experiences**  
Two or more disciplines learning together enhanced learning outcomes and improved attitudes toward—as well as understanding of—mutual roles.                                                                                                                                                                                                                     |
<table>
<thead>
<tr>
<th>Author(s) and Year</th>
<th>Country</th>
<th>Student Cadre: T (total) I (intervention) C (comparison or control)</th>
<th>Literature Tier and (Grade)</th>
<th>Kirkpatrick Level</th>
<th>Focus and Summary</th>
</tr>
</thead>
</table>
| Al-Dabbagh and Al-Taee 2005 | Iraq | Physicians T: 84 I: 28 C: 56 | 1 (2) | B | B | **Focus:** varied clinical practice sites  
A community-oriented curriculum was compared to a traditional curriculum. When compared to the control group, the experimental group showed a significant increase in knowledge and performance skills. |
| Dornan et al. 2006 | N/A | Health professionals N = 73 studies | 1 (1) | A, B | A, B | X | **Focus:** varied clinical practice sites  
Early experience in clinical sites was motivating for students. This experience helped students be more confident with patients, less stressed, and more self-reflective. The experience also enhanced students’ professional identity. “It strengthened their learning and made it more real and relevant to clinical practice.” |
| Littlewood et al. 2005 | N/A | Medical students N = 38 studies | 1 (1) | A | X | B | **Focus:** varied clinical practice sites  
Early immersion into clinical practice fostered more positive attitudes toward studies, greater understanding of subject matter, and enhancement of clinical skills. This intervention was also beneficial to organizations, populations, and patients. |
| Chan 2004 | Australia | Nursing students T: 108 | 3 (6) | A | | **Focus:** varied clinical practice sites  
A clinical learning environment inventory was conducted in 14 metropolitan hospitals. Students who were satisfied with their placements indicated the importance of “task orientation” as an attribute of the clinical site. |
## Appendix G: The Context of Health Service Delivery

<table>
<thead>
<tr>
<th>Author(s) and Year</th>
<th>Country</th>
<th>Student Cadre: T (total) I (intervention) C (comparison or control)</th>
<th>Literature Tier and (Grade)</th>
<th>Kirkpatrick Level</th>
<th>Focus and Summary</th>
</tr>
</thead>
<tbody>
<tr>
<td>Buchan and Dal Poz 2002</td>
<td>NA</td>
<td>Nursing N/A</td>
<td>3 (6)</td>
<td>B</td>
<td><strong>Focus: appropriate deployment/assignments</strong> A literature review/summary of two searches concludes that the increased use of less qualified nursing staff will not be effective in all situations, although use of care assistants may improve organizational efficiency.</td>
</tr>
<tr>
<td>Boon et al. 2005</td>
<td>UK</td>
<td>Midwives T: 10 midwives, 4 preceptors</td>
<td>3 (7)</td>
<td>A,B</td>
<td><strong>Focus: supportive workplace environment</strong> This qualitative study examines the value of a preceptorship for newly qualified midwives, in hospital settings and in community settings. New midwives appreciated the period of support as an opportunity to consolidate their knowledge and skills.</td>
</tr>
</tbody>
</table>
## Appendix H: Regulation

<table>
<thead>
<tr>
<th>Author(s) and Year</th>
<th>Country</th>
<th>Student Cadre: T (total) I (intervention) C (comparison or control)</th>
<th>Literature Tier and (Grade)</th>
<th>Kirkpatrick Level</th>
<th>Focus and Summary</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cutcliffe et al. 2011</td>
<td>NA</td>
<td>Health professionals</td>
<td>3 (6)</td>
<td>B</td>
<td><strong>Focus: regulation</strong> Examples from developed countries and a case study indicate that the degree of independence among regulatory bodies not only creates barriers to reciprocity, but also creates barriers to effective discipline.</td>
</tr>
<tr>
<td>Fealy et al. 2009</td>
<td>NA</td>
<td>Nurses and midwives</td>
<td>3 (6)</td>
<td>B</td>
<td><strong>Focus: regulation</strong> This review of the history of professional regulation points to the present-day patchwork of generalist and specialist models of education, and discusses whether a single model is appropriate for global application.</td>
</tr>
</tbody>
</table>
### Appendix I: Performance Outcomes

<table>
<thead>
<tr>
<th>Author(s) and Years</th>
<th>Country</th>
<th>Student Cadre: T (total)</th>
<th>Literature Tier and (Grade)</th>
<th>Kirkpatrick Level</th>
<th>Focus and Summary</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ariff et al. 2010</td>
<td>Pakistan</td>
<td>Maternal, neonatal, and child health (MNCH) providers (Lady Health Visitors, Lady Health Workers, midwives, nurses, medical officers) T: 364 (knowledge) T: 123 (skills)</td>
<td>3(6)</td>
<td>2</td>
<td>X</td>
</tr>
<tr>
<td>Matsumoto, Inoue, and Kajii 2008b</td>
<td>Japan</td>
<td>Medical graduates T: 2,988</td>
<td>3 (6)</td>
<td>2</td>
<td>B</td>
</tr>
</tbody>
</table>
## Appendix J: Community Outcomes

<table>
<thead>
<tr>
<th>Author(s) and Year</th>
<th>Country</th>
<th>Student Cadre: T (total) I (intervention) C (comparison or control)</th>
<th>Literature Tier and (Grade)</th>
<th>Kirkpatrick Level</th>
<th>Focus and Summary</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mitchell and Lassiter 2006</td>
<td>USA</td>
<td>Dental students N/A</td>
<td>3 (6)</td>
<td>B</td>
<td><strong>Focus: client health behaviors increased</strong> A descriptive literature review assesses the relationship between preparation (recruitment/retention/graduation) of a diverse health care (dental) workforce, and the effect/impact this preparation has on reducing health disparities.</td>
</tr>
<tr>
<td>Akiode et al. 2010</td>
<td>Nigeria</td>
<td>Midwives T: 6 schools 149 graduates</td>
<td>3 (6)</td>
<td>B</td>
<td><strong>Focus: service utilization increased</strong> A national intervention was conducted to increase teacher competence and curriculum content in postabortion care. Graduates showed increased knowledge of, exposure to, and use of manual vacuum aspiration (MVA) in the workplace.</td>
</tr>
<tr>
<td>Tamblyn et al. 2005</td>
<td>Canada</td>
<td>Medical students T: 751 I: 151 C: 600</td>
<td>2 (4)</td>
<td>A,B</td>
<td><strong>Focus: service utilization increased</strong> The effect of a change to a community-oriented medical school problem-based learning (PBL) curriculum was tested. Graduates of the new curriculum demonstrated improved mammography screening rates and greater continuity of care.</td>
</tr>
</tbody>
</table>
**Appendix K: Priority Areas for Research**

<table>
<thead>
<tr>
<th>Elements of quality pre-service education (PSE)</th>
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<tbody>
<tr>
<td>Knowledge gaps exist concerning the following items:</td>
</tr>
<tr>
<td>- The relative benefit of preparing practitioners in certificate versus degree-granting programs</td>
</tr>
<tr>
<td>- The effect on competency when practitioners are prepared as generalists, followed by specialty education, versus when practitioners receive generic preparation for practice in the specialty role</td>
</tr>
<tr>
<td>- The favorable teacher/tutor/preceptor-to-student ratio in both academic and clinical settings</td>
</tr>
<tr>
<td>- The relationship between infrastructure improvement and resource allocation and educational quality</td>
</tr>
</tbody>
</table>

**Relationships between PSE, the health system, and individual client outcomes**

The linkages between the quality of PSE and professional practice—in place and over time—have not been well studied. It would be important to know the relationship between the following elements:

- Attainment of competency at the time of entry into practice, and retention of competency in the workforce
- Practitioner competency and clinical care outcomes (e.g., client satisfaction, professional behaviors, quality of services rendered)
- The content of the PSE evidence-based practice (EBP) curriculum and health system impacts (e.g., lifesaving practices implemented, access to care enhanced, adverse events reduced)
References


