

Reflection and reflective practice in health professions education: a systematic review

Karen Mann · Jill Gordon · Anna MacLeod

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Abstract The importance of reflection and reflective practice are frequently noted in the literature; indeed, reflective capacity is regarded by many as an essential characteristic for professional competence. Educators assert that the emergence of reflective practice is part of a change that acknowledges the need for students to act and to think professionally as an integral part of learning throughout their courses of study, integrating theory and practice from the outset. Activities to promote reflection are now being incorporated into undergraduate, postgraduate and continuing medical education, and across a variety of health professions. The evidence to support and inform these curricular interventions and innovations remains largely theoretical. Further, the literature is dispersed across several fields, and it is unclear which approaches may have efficacy or impact. We, therefore, designed a literature review to evaluate the existing evidence about reflection and reflective practice and their utility in health professional education. Our aim was to understand the key variables influencing this educational process, identify gaps in the evidence, and to explore any implications for educational practice and research.

Keywords Health professional education · Practicing health professionals · Health professional students · Reflection · Reflective practice · Systematic literature review

Introduction

Today's health care professionals must function in complex and changing health care systems, continuously refresh and update their knowledge and skills, and frame and solve

K. Mann (✉)
Division of Medical Education, Faculty of Medicine, Dalhousie University,
Halifax, NS, Canada B3H4H7
e-mail: karen.mann@dal.ca

J. Gordon
University of Sydney, Sydney, NSW, Australia

A. MacLeod
University of South Australia, Adelaide, SA, Australia

complex patient and healthcare problems. Preparing professionals who possess these capabilities is correspondingly complex.

Reflection and reflective practice are frequently noted in the general education literature and are increasingly described as essential attributes of competent health care professionals who are prepared to address these challenges. (Argyris and Schön 1974; Boud et al. 1985; Epstein and Hundert 2002; Moon 1999; Schön 1983, 1987). Formal requirements for practitioners to provide evidence of reflective practice are becoming part of licensing and revalidation processes (Catto 2005; College of Family Physicians of Canada 2007; General Medical Council 2005). That this is so may reflect several converging lines of beliefs, assumptions and reasoning.

First, to learn effectively from one's experience is critical in developing and maintaining competence across a practice lifetime. Most models of reflection include critical reflection on experience and practice that would enable identification of learning needs (Schön 1983; Boud et al. 1985). Secondly, as one's professional identity is developed, there are aspects of learning that require understanding of one's personal beliefs, attitudes and values, in the context of those of the professional culture; reflection offers an explicit approach to their integration (Epstein 1999). Thirdly, building integrated knowledge bases requires an active approach to learning that leads to understanding and linking new to existing knowledge. Finally, taken together, these capabilities may underlie the development of a professional who is self-aware, and therefore able to engage in self-monitoring and self-regulation (Bandura 1986).

Boud (1999) has asserted that the emergence of reflective practice is part of a change that acknowledges the need for students to act and to think professionally as an integral part of learning throughout courses of study, rather than insisting that students must learn the theory before they can engage in practice. The response to these influences has resulted in an increasing array of curricular interventions. Activities to promote reflection are now being incorporated into undergraduate, postgraduate and continuing medical education, and across a variety of health professions. The evidence to support and inform these curricular interventions and innovations remains largely theoretical and it is unclear which approaches may have efficacy or impact (Andrews 2005).

Yet, despite reflection's currency as a topic of educational importance, and the presence of several helpful models, there is surprisingly little to guide educators in their work to understand and develop reflective ability in their learners. Further, the literature is dispersed across several fields, including education, nursing and psychology, among others. In each field, underlying values, and 'cognitive' and 'normative' maps differ (Clark 2006), making common terminology and understanding a challenge.

We therefore designed a literature review to evaluate the existing evidence about reflection and reflective practice and their utility in health professional education. Our aim was to understand the key variables influencing this process, identify gaps in the evidence, and to explore any implications. We also reasoned that, consistent with Kolb's (1984) observations that in observing and analysing current trends, it may be possible to identify simplified models of experience, eg. the common characteristics of teaching and learning that promote reflection and reflective practice.

Reflection defined

Many definitions of reflection can be found. To guide our review we used three definitions, to reflect both the nature of the reflective activity and its translation into professional practice.

As early as 1933, Dewey defined reflection as “active, persistent and careful consideration of any belief or supposed form of knowledge in the light of the grounds that support it and the further conclusion to which it tends” (p. 9). In this sense, reflection shares similarities with our understanding of critical thinking. Moon (1999) describes reflection as “a form of mental processing with a purpose and/or anticipated outcome that is applied to relatively complex or unstructured ideas for which there is not an obvious solution” (p. 23).

Boud et al. (1985) define reflection as “a generic term for those intellectual and affective activities in which individuals engage to explore their experiences in order to lead to a new understanding and appreciation” (p. 19). All three definitions emphasize purposeful critical analysis of knowledge and experience, in order to achieve deeper meaning and understanding. Boud’s definition more explicitly focuses on one’s personal experience as the object of reflection, and is more explicit about the role of emotion in reflection.

Schön (1983) introduced the concept of the “reflective practitioner” as one who uses reflection as a tool for revisiting experience both to learn from it and for the framing of murky, complex problems of professional practice. Similarly, reflective learning involves the processing of experience in a variety of ways. Learners explore their understanding of their actions and experience, and the impact of these on themselves and others. Meaning is constructed within a community of professional discourse, encouraging learners to achieve and maintain critical control over the more intuitive aspects of their experience.

Models of reflection and reflective practice

The review is informed by models of reflection described by Schön (1983, 1987), Boud et al. (1985), Mezirow (1991), Dewey (1933), Hatton and Smith (1995), and Moon (1999). We do not describe these models in detail within this paper; rather, in Table 1 (Panels a, b), we illustrate the ways in which these authors have conceptualized reflection.

Most models of reflective practice depict reflection as activated by the awareness of a need or disruption in usual practice. This tends to happen in complex or non-routine situations where the individual’s “knowing-in-action” (Schön 1983), and/or habitual action are inadequate to frame or resolve the problem. These models are based in both theory and empiric data. Their common premise is that of returning to an experience to examine it, deliberately intending that what is learned may be a guide in future situations, and incorporating it into one’s existing knowledge.

There are two major dimensions to the models of reflection we reviewed, as follows:

- a: an *iterative* dimension, within which the process of reflection is triggered by experience, which then produces a new understanding, and the potential or intention to act differently in response to future experience. Among the models that conceptualize reflection as an iterative process are Boud, Keogh and Walker (1985) and Schön (1983).
- b: a *vertical* dimension, which includes different levels of reflection on experience. Generally the surface levels are more descriptive and less analytical than the deeper levels of analysis and critical synthesis. The deeper levels appear more difficult to reach, and are less frequently demonstrated. The models which focus on the depth and quality of reflective thinking include Dewey (1933), Hatton and Smith (1995), Mezirow (1991) and Moon (1999).

Table 1 Models of reflection and reflective practice describing (a) an iterative process; (b) vertical dimensions

Author	Process of reflection (Iterative)
(a) An iterative process	
Schön (1983, 1987)	1. Knowing-in-action, 2. Surprise, 3. Reflection-in-action, 4. Experimentation, 5. Reflection-on-action
Boud et al. (1985)	1. Returning to experience, 2. Attending to feelings, 3. Reevaluation of experience, 4. Outcome/Resolution
Author	Levels of reflection (Vertical)
(b) Vertical dimensions	
Dewey (1933)	1. Content and process reflection, 2. Premise reflection/critical reflection
Mezirow (1991)	1. Habitual action, 2. Thoughtful action/Understanding, 3. Reflection, 4. Critical reflection
Boud et al. (1985)	1. Association, 2. Integration, 3. Validation 4. Appropriation
Hatton and Smith (1995)	1. Description, 2. Descriptive reflection, 3. Dialogic reflection, 4. Critical reflection
Moon (1999)	1. Noticing, 2. Making sense, 3. Making meaning, 4. Working with meaning, 5. Transformative learning

Moon (1999) focuses on the role of reflection in learning, and embeds reflection into the learning process. This model identifies stages of learning from superficial to deep, with the latter involving reflective activity that enables integration of new learning into the learner's cognitive structure.

The model of Boud et al. (1985) includes both the iterative and vertical dimensions of reflection, including four levels of reflection in the stage of re-evaluating experience: association, integration, validation and appropriation.

Method

We conducted a systematic review of the research literature in the area of reflection and reflective learning in health professional education and practice.

Selection process

The PubMed, CINAHL, and PsychInfo databases were searched using the following keywords: *action; experience; insight; journal; personal; portfolio; professional; reflect; reflection; reflective practice; self-aware; and, self manage*. We also conducted hand searches and reviewed bibliographies of identified papers. The search was limited to English language papers published between 1995 and 2005, dealing specifically with medical or health professional education or practice.

The original search identified more than 600 papers, commentaries and reviews of the literature. To address our specific interest, we excluded all papers that did not describe research examining the process and outcomes of reflective practice in health professional education and practice. This resulted in the identification of 29 papers.

The identified papers (See Appendix 1—Studies Reviewed with Abstract for a detailed overview or Table 2—Summary of Reviewed Research Studies for a quick overview) are shown by type of study, journal of publication, country of location, educational level of subjects and profession studied. As shown, the majority of studies reported were in nursing and medicine; the largest percentage of papers (25%) was from the United Kingdom, and 17 of 29 utilized qualitative approaches to address the research question.

Table 2 Summary of 29 reviewed research studies

Type of study	Qualitative	n = 17	
	Observational	n = 8	
	Quasi experimental	n = 3	
	Mixed methods	n = 1	
Journals	<i>Nursing</i>		
	Journal of Clinical Nursing	n = 2	
	Journal of Advanced Nursing	n = 7	
	Nursing Inquiry	n = 1	
	International Journal of Nursing Studies	n = 1	
	<i>Medicine</i>		
	Medical Education	n = 9	
	Teaching and Learning in Medicine	n = 1	
	Academic Medicine	n = 1	
	Medical Teacher	n = 1	
	<i>Other</i>		
	Advances in Health Sciences Education	n = 3	
	Assessment & Evaluation in Higher Education	n = 1	
	Educational Psychology	n = 1	
Journal of Allied Health	n = 1		
Location	UK	n = 9	
	Brazil	n = 5	
	Finland	n = 3	
	USA	n = 3	
	Hong Kong	n = 3	
	Australia	n = 1	
	Canada	n = 1	
	Germany	n = 1	
	Netherlands	n = 1	
	New Zealand	n = 1	
	Sweden	n = 1	
	Level of subjects	Established Practitioners	n = 12
		Students	n = 11
Other		n = 6	
Profession	Nursing	n = 11	
	Medicine	n = 14	
	Other Health Professions	n = 4	

Review procedure

All 29 papers were read and coded independently by three reviewers (KM, JG, AM) using an adaptation of the coding protocol used in the Best Evidence Medical Education Systematic Reviews of the Literature in Medical Education (Harden et al. 1999) The resulting coding was synthesized and differences resolved through discussion.

To evaluate the premise that reflection and reflective practice are essential components of competence in health professionals, and therefore capabilities that must be acquired, we developed the following questions:

Do practicing health professionals engage in reflective practice?

What is the nature of students' reflective thinking?

Can reflective thinking be assessed?

Can reflective thinking be developed?

What contextual influences hinder or enable the development of reflection and reflective capability?

What are the potential positive or negative effects of promoting reflection?

Results

The results of the review are structured to summarize the relevant studies that addressed each of these questions in relation to medicine, nursing and other health professional contexts. Several studies addressed more than one of our questions. For clarity, we have highlighted the different aspects of a single study under the relevant questions.

Do practicing health professionals engage in reflective practice?

Although our purpose was to look for the effectiveness of reflection in health professions education, we felt it important to explore whether this activity could be demonstrated in practicing professionals. Eight studies explored reflective practice in practicing professionals; six were in medicine, and two in nursing. Reflection was a part of practice in all eight reports.

Mamede and Schmidt (2004, 2005) surveyed 202 Brazilian physicians, to study the structure of reflection in practice, focusing on the process of encountering complex problems. Participants demonstrated individual differences in their orientation to and use of reflection. Two correlates of reflective practice emerged (Mamede and Schmidt 2005); reflective practice appeared to decrease with increased years in practice, and in practice settings where the scientific basis of clinical practice was not reinforced.

Further, Mamede and Schmidt (2004) found that reflective practice in medicine in their study had a five-factor structure: deliberate induction, which involves the physician taking time to reflect upon an unfamiliar problem; deliberate deduction, which occurs when a physician logically deduces the consequences of a number of possible hypotheses; testing, which involves evaluating predictions against the problem being explored; openness to reflection, occurring when a physician is willing to engage in such constructive activity when faced with an unfamiliar situation; and, meta-reasoning, which means that a physician is able to think critically about his or her own thinking processes. This five-factor model is not a step-by-step process; rather, each factor is a unique dimension, overlapping and occurring during and following an event.

Klemola and Norros (1997, 2001) observed and interviewed anesthetists ($n = 16, 8$ respectively) to explore the role of the patient monitor in their operating room practice and to understand how they thought about their anesthetized patients and responded to information they received while caring for them. Their findings suggested two distinct approaches to practice, or “habits of action”: the “interpretive orientation” guided by a belief in an unpredictable world, and the “reactive orientation,” guided by a belief in a predictable world. The authors suggested that the interpretive orientation contributed to the development of reflective and critical capabilities, but the reactive or objectivistic orientation hindered their development.

Two studies of reflection in clinical teaching in medicine were found (Pinsky and Irby 1997; Pinsky et al. 1998). The authors surveyed 48 distinguished clinical teachers in medicine regarding the role of reflecting on instructional success in their professional development as teachers. They identified three phases of reflection: anticipatory reflection, which used past experience for planning teaching activities; reflection-in-action, which involved maintaining flexibility during teaching; and, reflection-on-action, which involved thoughtful analysis of the experience. Anticipatory reflection was most frequently described (86% of comments) and involved learning from and incorporating previous experience into the teaching plan. The authors described the process of these successful teachers as an ongoing, iterative process of observing, reflecting and experimenting. In a parallel study (Pinsky and Irby 1997), the same authors reported how physician teachers reflected on failures in their teaching to improve it. Half of the 20 respondents believed that reflecting on failures was as or more important than reflecting on successes. Both studies support the role of reflection in the ongoing professional development of teachers.

Two studies are reported of reflection in practicing nurses (Gustafsson and Fagerberg 2004; Teekman 2000). Both used in-depth qualitative methods. In the first, (Gustafsson and Fagerberg 2004) four nurses described reflection both as an individual activity and as “mirroring”, where team members reflected together to exchange ideas and develop care. Similar to the physician studies, nurses described an anticipatory or pre-reflection, occurring before an activity, as central to their practice. They also described reflection both “in” their practice and “on” it. Participants reflected on ethical considerations, on situations that required courage and novel situations requiring creative approaches. They reported guidance and supervision as key to reflection.

Teekman (2000) studied ten registered nurses, and analyzed ten non-routine nursing situations for the presence of reflective thinking. In complex situations, reflection included a variety of cognitive activities, framing and self-questioning. Supervision was a key factor. Teekman identified three hierarchical levels of reflection: reflective thinking-for-action (what to do here and now); thinking-for-evaluation (integrating multiple viewpoints); and, thinking-for-critical-inquiry.

She distinguished between reflective thinking for learning and reflective thinking as critical inquiry. Teekman explained the first as a strategy to make sense of a situation and to develop practical knowledge. She saw reflection-for-critical-inquiry as going beyond technical proficiency to considerations of context, and its influences on nursing practice and health. Teekman reported that respondents engaged in reflective thinking in order to act optimally in a situation; they were less able to reflect on the total situation from multiple viewpoints, and failed to demonstrate evidence of critical enquiry.

These exploratory studies reveal some aspects, functions and uses of reflective practice. Reflection appears to include an anticipatory phase, where past experience informs planning; it is encouraged by appropriate supervision; it appears to occur most often in novel or challenging situations, where the professional’s knowledge-in-action is not adequate to the

situation. The findings of these few studies suggest that physicians and nurses use reflection to inform practice, but that it is not a unitary phenomenon either within or across individuals.

What is the nature of students' reflective thinking?

Eight studies were found which addressed this question. These studies explored reflection in medical and health professions students, relating it to learning, professional identity development, and critical thinking.

Sobral (2000) examined students' reflection-in-learning as they began their clinical clerkship using a 10-item self-report questionnaire. The author compared 103 student participants in an elective experience with 91 non-randomized controls who did not participate. The mean reflection-in-learning score in the participant group was 47.16 (SD 7.45) of a possible 70; in the control group, the mean score was 50.45 (SD 6.92).

Boeninck et al. (2004) studied reflection in 195 4th year preclinical Dutch students who responded in writing to four vignettes containing ethical dilemmas. Women, students with health care work experience, and those considering general practice as a career scored significantly higher on all vignettes. There were no significant differences across vignettes. The authors suggested that reflection was influenced by three factors: a general tendency to be reflective, varying levels of skill at reflection, and knowledge and experience.

Niemi (1997) undertook a longitudinal exploration of reflection among 110 medical students during the preclinical years, using student learning logs and identity status interviews. Based on content analysis, they described four levels: committed reflection ($n = 14$), meaning an analytical consideration of the experiences and observations made in the health care centre; emotional exploration ($n = 27$), an exploration characterized by self-consciousness, emotional expressions and embarrassment; objective reporting ($n = 27$), an exploration focused on objective events, clinical facts and performance; and, scant or avoidant reporting ($n = 23$) meaning reporting which is scant, empty, avoidant or diffuse. The committed reflectors were the smallest group ($n = 14$), and they displayed the most mature thinking. Committed reflectors were most certain of their professional choice, and tended to reach 'achieved identity status,' which is an identity status developed through personal self-exploration and commitment to personal goals, more often than the other groups.

Pearson and Heywood (2004) studied reflection through a survey of attitudes toward and reported use of reflective portfolios in learning among UK GP registrars (postgraduate students). Sixty-five percent of 92 responders used the portfolio regularly for recording, and 42% used it in reflective learning. Three categories emerged in relation to the portfolio: reflectors, those who recorded data in the portfolio, reflected on that information and/or discussed it; recorders, those who used the portfolio to record data; and, non-users, those who did not record data in the portfolio. The role of the trainer/supervisor appeared critical. Those registrars who found the portfolio useful tended to be the reflectors.

Wong et al. (1995) used the models of Boud et al. (1985) and Mezirow (1991) to analyze 45 reflective learning essays of RNs registered in a *Nurse as Educator* course. The analysis identified non-reflectors ($n = 6$), reflectors ($n = 34$) and critical reflectors ($n = 5$). Non-reflectors were descriptive and non-analytic; reflectors described and related experience, and developed new learning opportunities; critical reflectors validated assumptions and sometimes transformations of perspectives occurred.

Hallett (1997) conducted 26 interviews, 12 with nursing students and 14 with their district nurse supervisors from a new program for nursing education which featured a community placement. The purpose of the interviews was to explore students' and supervisors' opinions of the community-based work. Students believed that confidence and the ability able to think reflectively about their practice developed only after some practice experience.

Kember et al. (2000) used a 16-item questionnaire to measure reflective thinking in students, assessing four constructs as described by Mezirow (1991): habitual action; understanding; reflection; and, critical reflection. Habitual action represents action that is automatic or with little conscious thought; the remaining constructs represent increasing depth of reflective thinking. Undergraduate and postgraduate students ($n = 303$) in occupational therapy, physiotherapy, radiography and nursing participated. In all groups, habitual action and critical reflection (the least and most analytical levels, respectively) were least frequently demonstrated. No statistically significant differences in reflective thought emerged across groups; however there were statistically significant differences between undergraduate and postgraduate students on all four constructs; the latter group were more likely to use deeper forms of reflection.

Williams and Wessel (2004) studied weekly reflective journal entries of 48 physical therapy students, using five levels of reflection (Williams et al. 2000). The five levels, from the least to the most analytic, and the number of students who achieved each were: 'describes learning' and 'analyses learning' (both 100%); 'verifies learning' (96%); 'gains a new understanding' (66%); and, 'indicates future behaviour' (25%).

The studies of students involve larger numbers of participants, and over several professions and levels of learners. As with practitioners, students demonstrated different orientations to reflection and different levels of reflective thinking; similarly, the deeper reflective levels appeared most difficult to achieve. The observations made about mature professionals seem to apply equally to students, despite the fact that students do not have the same opportunities for reflective practice in authentic settings.

Can reflective thinking be assessed?

Most studies identified in our review offered descriptions of reflective thinking; we explored whether the process is amenable to valid and reliable assessment. Nine studies addressed this question. In several of the studies, relationships with other variables were explored, as a means of validating the instruments used and assessments made.

Sobral (2000) used a 10-item self-report questionnaire to appraise self-reflection in learning, with 103 medical students. The questionnaire asked students to think about their learning experiences in the medical program and featured a seven-point scale anchored at the extremes by the responses 'never' = 1 and 'always' = 7. A validation study showed high internal consistency ($\alpha = 0.81$) and moderate stability across time (test-retest correlation, $r = 0.65$ after 3 months). Factor analysis identified two dimensions of integration and monitoring of learning. Sobral found positive relationships between some items in the Course Valuing Inventory (CVI) (Nehari and Bender 1978) and reflection scores. These were: relating and making sense of course content ($r = 0.46$); achievement of personal goals ($r = 0.44$); acquiring a clear and integrated notion of learning ($r = 0.36$); and a sense of self-esteem related to the course experience ($r = 0.34$).

Subsequently, Sobral (2001) attempted to identify relationships between measures of reflection and approaches to study, perceived learning outcomes and academic

achievement. Students ($n = 196$) completed the 14-item Reflection-in-Learning Scale (RLS) along with the CVI and the Approaches to Study Inventory (ASI) (Richardson 1990). The RLS is a self-report questionnaire. Each item is appraised via a seven-point response scale ranging from 'never' = 1 to 'always' = 7. The instrument also includes a four-point global scale designed to assess personal efficacy for reflection in learning. Positive, significant relationships were found between RLS scores and the CVI ($r = 0.55$; $p \leq 0.01$) and the ASI's Meaning Orientation ($r = 0.52$; $p \leq 0.01$). These relationships supported the theoretical stance that reflection and deep learning are positively related and provided some evidence of construct validity.

Building on this research, Sobral (2005) further explored the construct validity and reliability of the 14-item RLS scale, which appraises the reflective learning process, with 275 students. The author found support for the construct validity of the RLS scale, with reliability analysis showing good internal consistency for both start of term ($\alpha = 0.84$) and end-of-term ($\alpha = 0.86$) measures.

Leung et al. (2003) explored the relationship of deep learning to reflection and of surface learning to non-reflective forms of thinking. Students from all years of study in a health science faculty ($n = 402$) completed the Revised Study Process Questionnaire (Biggs et al. 2001), and the Reflection Questionnaire (Kember et al. 2000). The authors found that the surface learning approach was correlated with habitual action ($r = 0.65$), while deep learning approaches were correlated with understanding ($r = 0.33$), reflection ($r = 0.49$), and critical reflection ($r = 0.50$). Their findings also supported an association between approaches to learning and reflective thinking.

Boenink et al. (2004) developed a semi-structured questionnaire to measure reflection among Dutch students in Year 4, prior to entering their clinical experience. The instrument utilized four case vignettes, to which students responded, split into two alternate halves (R1 = cases 1 & 2, R2 = cases 3 & 4). Consistency across measurements was acceptable ($r = 0.38$; $p < 0.01$). Correlations across vignettes were also moderate ($r = 0.35$ for R1 and $r = 0.41$ for R2) ($p \leq 0.000$). Inter-rater reliability ranged from $r = 0.53$ to 0.94.

Mamede and Schmidt (2004) developed an instrument to understand the nature of reflection in medical practice. Using an 87-item questionnaire, of which 65 questions were related to reflective practice, they identified a multidimensional, five-factor model of reflective practice. The factors and reliability of each were: deliberate induction ($\alpha = 0.83$); deliberate deduction ($\alpha = 0.81$); testing and synthesizing ($\alpha = 0.79$); openness for reflection ($\alpha = 0.86$); and, meta-reasoning ($\alpha = 0.68$). This study identified constituent elements of reflection and provides a basis for further investigating the structure of reflective practice and the relations between doctors' reflective practices and the degree of expertise that they develop and maintain throughout their professional life.

Wong et al. (1995) attempted to develop and test coding systems for written reflective journals, based on the models of reflective thinking of Boud et al. (1985) and Mezirow (1991). Boud et al. (1985) categorized six stages of increasing depth of reflection: *attention to feelings*, *association*, *integration*, *relationship-seeking*, *validation*, *appropriation* and *outcome*. Forty-five journals were subjected to content analysis. Using Boud's categories, the category of attending to feelings was most commonly used, along with association and integration. The journals were also categorized using Mezirow's categories into non-reflectors, reflectors and critical reflectors. Reflectors showed evidence of Boud's first three categories, but no change in critical perspective. The critical reflectors also demonstrated these categories, but also demonstrated a changed perspective. Some coding difficulties were encountered; agreement levels of 0.5–0.75 were reached. The author concluded that

reflective journals could be used to demonstrate the presence or absence of reflective thinking.

Kember et al. (2000) developed a four scale 16-item questionnaire to measure reflective thinking, based principally on Mezirow, and administered it to 303 students from eight classes of a health sciences faculty. The four scales, each measuring a construct, along with their reliability estimates, were: habitual action (Cronbach's $\alpha = 0.62$); understanding ($\alpha = 0.76$); reflection ($\alpha = 0.63$); and, critical reflection ($\alpha = 0.68$). Confirmatory factor analysis showed a good fit to the four factor structure. Comparison of mean scores between the eight classes showed predicted differences on each of the four scales between undergraduate and postgraduate students.

Pee et al. (2002) examined 26 dentistry students' reflective thinking using a structured activity called 'A learning experience' (ALE), modeled after Boud (1985). They judged reflective thinking using three models: Johns's (1992) 18 questions, Hatton and Smith's (1995) 'levels of reflection', and peer review. Those students who completed a greater number of Johns's questions were more likely to exhibit critical reflection. Using each model, most students who completed the exercise demonstrated reflection at deeper, as well as descriptive, levels. The extent to which the ALE facilitated valid reflection is unclear. These authors questioned whether it is possible to create a 'safe' place for reflection, where students are not penalized, and whether assessment may be counterproductive if it destroys or undermines that safety.

From the studies reviewed, it appears that reflection can be assessed and different levels of reflection discerned. Further, the studies demonstrate that measures of reflection correlate with other measures in theoretically consistent ways. Students do not have the same opportunities as professionals do for reflective practice in authentic settings and therefore some questions remain regarding whether what is being measured (e.g. text) is a valid indicator of reflective activity, when one considers the influences of context and culture. Despite these concerns, failure to assess reflection and reflective thinking may imply to learners lack of real value for this activity.

Can reflective thinking be developed?

Four studies addressed the development of reflective thinking. Sobral (2000) studied the development of reflective thinking based on activities designed to foster reflection during an elective experience. 103 students working in small groups were encouraged to participate in: self-appraisal of their learning, discussion of their learning strategies and feedback about them to others in the group. A non-randomized group of controls was made up of students who did not participate. Prior to participating in the elective, there were no significant differences between course participants and non-participants with respect to sex, learners' characteristics (Kolb's learning style, self-confidence as a learner, and the meaning orientation of the short version of the Approaches to Study Inventory), and grade-point average. In post-course measures, participants' level of reflection changed from pre to posttest. The start of term reflection in-learning score for course participants was 47.16. In post-course measures, participants' level of reflection changed from pre to posttest. The end of term reflection-in-learning score for participants was 52.71. The controls' level of reflection did not change. Eighty-one percent of participating students had increased scores for reflection in learning compared with 45% in the comparison group; also, the level of reflection-in-learning was significantly associated with self-perceived competence for self-regulated learning ($r = -.60$; $p = 0.001$), and with the meaningfulness of the learning

experience ($r = 0.38$; $p = 0.001$). Further, those with higher reflection in learning skills had higher GPAs. Higher scores were associated with higher scores on self-reported diagnostic competence ($r = 0.34$; $p = 0.001$).

Beecher et al. (1997) evaluated whether the preparation of an educator's portfolio also stimulated reflective thinking. Ten medical faculty members participated in a semi-structured interview, after preparing educational portfolios for promotion. Four overlapping and non-sequential categories of reflection emerged: 'surfacing of dilemmas in practice'; 'seeking supports'; 'reformulating educational practice' and, (a resulting) 'transformation of educational practice'. The authors concluded that the process of portfolio preparation provided a forum and stimulus for reflective thinking, as well as a platform for change.

Duke and Appleton (2000) examined 160 nursing assignments in the context of a one year palliative care program. The development of reflective skills over time was assessed by a Wilcoxon paired signed-rank test on data from 51 students who took two modules in different terms during the year. The results suggested that reflective practice did develop over time. Students could readily provide descriptive information about their practice but found the analysis of knowledge and the context of care more difficult.

Williams and Wessel (2004) reported evidence of development of reflective thinking in their analysis of 48 physical therapy students' journal writing during an 8-week academic unit in a 24-month program. The journals were evaluated using the five criteria for grading reflective journals developed by Williams et al. (2000). The authors noted that the validity of the study could be questioned on the grounds that the students were more likely to write what they thought the teacher wanted to read.

The findings of these few studies suggest that reflective thinking may develop in association with certain interventions. It also appears that the development of reflective thinking is related to other aspects of learning and professional development. The methods employed were usually observational and analytical, and appropriate to the questions asked. However, only one of these studies had a comparison group, so the transferability of the interventions and results across contexts is unclear. In addition, reflection was not spontaneous, but was deliberately stimulated by the educational context. Although it seems likely that events occurring naturally in an authentic professional context would stimulate a similar response, this has not been demonstrated.

What contextual influences hinder or enable the development of reflection and reflective capability?

Twelve studies addressed the contextual influences which hinder or enable the development of reflection and reflective capability.

Several studies explored the effect of context on reflection and reflective thinking. Sobral (2000) found evidence for improved quality of learning as students strive for control of their learning. He suggests that a greater effort at reflection is associated with a more positive learning experience, and that reflection in learning is related to readiness for self-regulated learning, and to the meaningfulness of the experience.

Boenink et al. (2004) speculated that student fatigue and interest in responding to clinical situation vignettes may have accounted for the difference between pre- and post-test scores in his group of 195 Year 4 medical students, suggesting that the context and student factors may affect reflective ability.

Mamede and Schmidt (2005) found two correlates of reflective practice: reflection appeared to decrease with increasing years in practice, and was lower in practice settings where reflective thinking was not reinforced. The authors noted that time pressure in a busy clinical environment can act as a barrier to reflection. They suggested that complex problems stimulate reflective thinking, especially if the scientific basis of clinical practice is continuously revisited. They also speculated that, as experience increases, one's "knowing in action" may be sufficient to frame and address most clinical situations.

Dornan et al. (2002) studied the uptake and use of portfolios in general practice. Portfolios were seen as a means of stimulating reflection. Physicians attending a continuing medical education course were offered a one year free trial of a PC Diary. Fourteen percent of eligible persons attended training workshops; of those only 10% used the diary regularly. Practical barriers included time pressures, lack of computer access, literacy and support. The main philosophical barrier to using the portfolio appeared to be its lack of congruence with the users' learning styles.

Pearson and Heywood (2004) found that portfolio use was enhanced with a supportive trainer, clear objectives, and sufficient time. However, even in the presence of these facilitators, many respondents expressed a dislike for the portfolio and found it unhelpful for reflection.

Beecher et al. (1997) found that the creation of an educator's portfolio tended to stimulate reflective thinking. However, those who chose to participate were positively inclined toward reflection and may have been particularly willing to use it to reach a particular goal.

Portfolios may not be the key factor in promoting reflective learning; the mentoring relationship, which can be expressed in a number of different ways, may be more important than the portfolio itself in stimulating and guiding reflection. Two studies of practicing nurses (Teekman 2000; Gustafsson and Fagerberg 2004) identified supervision as a key factor promoting reflection in practice.

Two studies addressed the development of reflective ability in the context of a small group. Platzer et al. (2000) studied nurses enrolled in a post-registration Diploma in Professional Studies in Nursing. Four groups of 6–10 students met approximately 15 times over a term of study. Group facilitation was modeled on Mezirow (1981). Some students reported significant developments in their critical thinking ability, and some experienced perspective transformations leading to changes including: an increased sense of professionalism, greater autonomy in decision-making, more confidence to challenge the status quo and a less rule-bound approach to their practice. The development of reflective thinking was fostered by the mutual support of group members, the challenge to consider things more deeply and the opportunity to learn from the others' experience. In the authors' view, the group experience enabled participants to be part of a self-regulating body, thus modeling professionalism-in-action.

The second report of reflection in a group context (von Klitzing 1999) involved seven nurses in a psychodynamic group caring for the terminally ill. The group met 31 times over a year, over which time, unexpectedly, the nurses were observed to reflect less on themselves and more on their patients.

Mantzoukas and Jasper (2004) used ethnography to explore with 16 nurses their views of reflection within their daily practice, the relationships between the organizational culture of the wards and the practitioners, and whether reflective methods of practice were implemented. Four themes emerged: relationships between doctors and nurses; relationships between nurses and managers; nursing practice; and, nursing input into a clinical situation. It appeared that the organizational hierarchy of the ward, specifically the

authority of the medical staff, portrayed reflection as an abnormal method of practice and knowledge development. As a result, reflection became confined to nurses' personal time and space. The study underscored some of the challenges that face inter-professional education in relation to reflective practice.

Francis et al. (1998) studied nurses following a one year course addressing nursing inquiry in philosophies of nursing. Journal writing was a major element of the course. The study explored the change in learners' appreciation of the complexity of nursing and consideration of critical theorizing. Several factors contributed to change: prior experience of journal writing, viewing reflection as including reflection-*on*-action as well as *in*-action, having prior models of reflection (e.g. everyday reflection), expectation of nursing as a complex practice involving both science and communication, and having comfort in trying things out in the group session. Those who reported no change had had no previous experience of journal writing, viewed reflection as occurring only in action, and had no prior models for reflection. They viewed personal and professional thinking as separate, lacked comfort in the group setting, and were focused on individual evaluation.

Across all of the diverse settings and methods, it appears that the most influential elements in enabling the development of reflection and reflective practice are a supportive environment, both intellectually and emotionally; an authentic context; accommodation for individual differences in learning style; mentoring; group discussion; support; and, free expression of opinions. Additional enabling factors include perceptions of relevance, positive prior experience, organizational climate, including respect between professionals, and time for reflection.

What are the potential positive and negative effects of promoting reflection?

Eight studies addressed the potential positive and negative effects related to the promotion of reflection.

Several studies generated findings that indicated benefit to learners. Sobral (2000) suggests that the ability to form associations and integrate information may result in deeper learning, facilitating students having a more positive learning experience.

Reflective practice may also improve relationships among teachers and learners and teaching quality. Beecher et al. (1997), in assessing the effects of creating an educator's portfolio, found that 8 of 10 faculty participants changed their interactions with peers, as indicated by the development of new programs, communication with colleagues and changing methods of advising. For the 48 distinguished teachers interviewed by Pinsky et al. (1998) reflective practice was integral in planning and anticipation of teaching, in responding (in action) to dynamic changes in the teaching encounter, and in reflecting on action to improve teaching.

Two nursing studies identified potential positive outcomes. Hallett's (1997) study of nurse practitioners learning in the community found that learners were able to connect theory and practice with the assistance of a facilitator, following some basic practice experience. This finding suggests that the benefits of reflection may rely on appropriate timing of the intervention as well as supervisor support.

Glaze (2001) explored 14 advanced nurse practitioners' experiences of reflection. Students completed two reflective practice modules, one prior to entry and one during an M. Sc. degree. The modules were built on a three-level model of reflection that progressed from simple problem-solving to using theories and literature in the analysis of a scenario, to the consideration of broader political and social factors. Students kept a reflective

journal and were interviewed about their experiences of reflection. Thirteen students' interviews revealed improved understanding of context, transforming perspectives, deepening understanding through literature, and re-appreciating the value of nursing. Respondents most often perceived improvement of clinical practice as the chief benefit from reflection, which was seen to make practitioners 'more thoughtful,' to increase awareness of uncertainty' and to highlight that there is not always one right answer.

Some potentially negative outcomes were also reported in the nursing literature. Burnard (1995) interviewed 12 nurse educators about their perceptions of reflection and reflective practice. Concerns were expressed about the time required and the limiting influence of a structured approach. Still others worried that reflection was a 'fad.' Similar to Strawson (2004), the authors questioned the extent to which, in reflecting, we can remember events as they actually were.

While no study in medicine directly addressed negative effects, some may be hypothesized from studies such as those of Pearson and Heywood (2004) and Dornan (2002). These might include resentment at being required to participate in activities that seem disconnected from the learner's true learning needs or usual methods of learning and practice. Learners may perceive such activities as "busy work."

Discussion

In this section, we discuss the current state of research in this area. We summarize the findings briefly and relate the literature to existing models of reflection. We also highlight the assumptions and relationships that are not yet supported by research evidence. Lastly, we offer implications for research and for educational practice.

Current state of the research

The research literature on the effectiveness of strategies to foster reflection and reflective practice is still early in development. We identified only 29 studies, the majority of which were observational in nature. Comparison groups were rarely included. At the time of our review, no randomized controlled studies were identified. However, many of the studies employed carefully conceptualized, theoretically-based qualitative methods and analytic approaches. The methods employed were appropriate to the research questions and led to reasonable estimates of study quality and findings.

Because of the early stage of development in this area, qualitative and exploratory research approaches are appropriate to use to develop general understanding of the construct, common definitions and terminology. Qualitative inquiry also informs understanding of theoretical perspectives and models which best seem to inform reflection and reflective practice in medical education. Comparative research approaches can be more appropriately utilized once these common understandings have been developed.

That said, the review revealed several carefully developed instruments and analytic approaches for measuring reflective thinking. Where these were developed for a specific study, their construction and validation were clearly described and appropriate psychometric data provided. These instruments can provide a useful steppingstone to further study of reflection. In some studies, the measures were taken as part of instrument development; it will be important to use them as outcome measures of actual interventions to better understand their properties. Further complicating the assessment of reflection is the

influence of the context on students' perceptions of safety in revealing their personal reflective thoughts. This may be particularly relevant where journals or portfolios are involved, and this is discussed later in this section.

One particular challenge of the review was the use of varied terminology across studies and fields. This hindered interpretation, comparison and synthesis of the data. Many studies did not identify the definition of reflection being used by the authors. Secondly, the terminology used to describe and classify reflective thinking drew on several fields, and so reflected different professional and disciplinary discourses. These terms were not always explained for the more general reader, nor readily compared.

Summary of our findings

This literature review allows us to identify certain influential variables that can form the foundation for future studies. It also reveals the gaps in the existing literature, both in content and methodology. None of the empirical studies that we reviewed addressed outcomes of reflective practice and their effect on professionals, and none addressed the effect upon professional practice beyond self-report. However, several illuminating and important findings appear consistently across study designs, study groups and professions. They are summarized below:

Reflection is demonstrated among practising professionals. It appears that it fulfills several functions, including helping to make meaning of complex situations and enabling learning from experience. Reflection does not occur in all situations; the process appears to be stimulated most often by complex clinical problems. As the perceptions of these problems vary according to individuals' experience, the process will vary across individuals and the contexts in which they practice. The tendency and ability to reflect also appears to vary across individuals.

In practising professionals, the process of reflection appears to be multi-factorial and to include different aspects. In addition to reflection both on and during experience, it appears that the anticipation of challenging situations also stimulates reflection.

Students in all health professions studied demonstrated reflective thinking, as assessed by various means, including responses to vignettes, analyses of reflective journals, and completion of survey instruments. As with practising professionals, the tendency and ability to reflect varied across individuals. Students less frequently had authentic practice experience on which to reflect. Reflective thinking in students appears to be associated with approaches to learning; specifically, reflective thinking at the deeper levels is associated with deep approaches to learning and meaning-making.

Several approaches to assessment of reflective thinking were reported. It appears that reliable means of assessing the presence and nature of reflective thinking exist. In addition, the validity of some instruments is supported by relationships to existing instruments in theoretically consistent ways. It appears to be possible to demonstrate different dimensions of reflection and different levels or depth of reflection. Deeper levels of reflection are less frequently identified and, as a result, appear to be more difficult to achieve.

The ability to reflect seems to be amenable to development over time and with practice, and in the presence of certain stimuli (e.g. small groups). It also appears that the learning environment can have an encouraging or inhibiting effect on reflection and reflective thinking. An important factor seems to be the behaviour of mentors and supervisors.

In summary, considering the studies in terms of their impact in helping understand the nature of reflection and the situations and factors with which it appears to be associated, the literature offers considerable information.

Relationship of the literature to the models

We began this review with an overview of models of reflection available in the literature. We return now to the models, in light of our review findings. The idea of reflection as an iterative process was frequently supported in the literature. Of the iterative models, aspects of Schön's model were clearly evident:

Knowing-in-action and surprise

Schön's premise that reflection was stimulated in response to complex problems was supported by the studies of Mamede and Schmidt (2004, 2005). These studies also supported the role of surprise in generating reflection, and it appears that surprise may occur in the form of a new or unrecognized, complex problem. The 2004 study showed a negative relationship between the tendency to reflect and years in practice. As reflection was reported as a strategy for dealing with complex problems, one explanation might be that the "surprise" of a complex problem occurs less often with increasing experience. Referral patterns and other health care delivery factors may also play a role.

Reflection-in-action

Klemola and Norros (1997) work supported this aspect of the model, as the physicians who demonstrated an "interpretive orientation" responded to minute-by-minute changes in their patients' condition—monitoring and assessing on a continual basis. The Pinsky et al. (1997, 1998) studies also supported "reflection-in-action" among teachers in the course of their teaching. The notion of experimentation was also evident in these two studies, as the respondents described trying new approaches in response to the feedback they were receiving. Notably, reflection-in-action was not explored or evident in studies of students, possibly because these studies were not reflecting on actual experience as it occurred.

Reflection-on-action

Reflection-on-action was also described, particularly by teachers. For example, the educator's portfolio involved a process of considering one's teaching, which required synthesis and led to several new insights for participants (Beecher et al. 1997). An activity called "anticipatory reflection" was described by both nurses and physicians. Although it clearly involved "reflection-on-action," it seemed to incorporate more than one specific activity; rather, reflection was a more integrative phenomenon, drawing on all relevant experience to date.

That Schön's model should be supported, even in studies where it was not specifically selected to frame the intervention, suggests some validity for his conceptual framework, which was originally grounded in observations of professional practice. The terminology

developed by Schön is also probably more a part of the current discourse of reflection in the health professions than that of some other models.

Moon's (1999) conception of reflection as closely linked to the quality of learning was also supported, particularly in the studies of Kember and Leung (2000), Leung and Kember (2003) and of Sobral (2000, 2001, 2005).

Several studies demonstrated differences in the level of reflection achieved, supporting the models that suggest that levels of reflection, from the more superficial to critical reflective analyses, can be reliably discerned. They include: Teekman (2000); Pearson and Heywood (2004); Wong et al. (1995); Williams and Wessel (2004); and, Pee et al. (2002). Where the studies used existing models for analysis, comparisons can be made. However, some variation in terminology makes comparisons of levels of reflection across studies difficult.

Boud et al. (1985) explicitly include in their model the idea that reflection should include the emotional aspects of experience. Moon (2004) argues that emotion is part of all learning, and that it is not specifically triggered by reflection. Particularly in the studies of practicing nurses, the element of emotion is explicitly present in the reflective process. It is unclear whether the fact that emotion is less often reported in other studies reflects a culture that encourages objectivity and therefore possibly leads to underreporting, or whether reflection, by its nature, tends to focus on the factual rather than the emotional elements of an experience.

Implications for research

Although the literature provided early findings, its synthesis highlights several questions for further study. We raise these questions here.

Does reflection enhance learning?

Deep approaches to study appear more likely to occur in association with reflective thinking. The connection between reflection and deep learning corresponds with a theoretical position of Moon (1999) that the iterative processes involved in reflection may be the key to moving from deep to surface approaches to learning. A clear understanding of deep and surface learning related to reflective and non-reflective thinking has yet to be developed. Leung and Kember (2003) have suggested that this has occurred because the two constructs have emerged from different fields of inquiry. The literature does suggest that a deep approach and reflection seem integrally related and mutually enhancing.

Does reflection improve self-understanding?

While it is intuitively appealing to regard reflective practice as a key to self-understanding, there is, as yet, little evidence to support this beyond self-report.

Is reflection most effective when shared?

There was some suggestion in the literature that shared reflection was more effective because it offers information from multiple sources and multiple perspectives (Gustafsson

and Fagerberg 2004). This is consistent with the literature on self assessment and underlies the rationale for multi-source feedback (360°) assessment. Johns's reflective questions (1992) are intended to stimulate a conversation with oneself; however, such one-sided conversation might lead to "single-loop" learning (Argyris and Schön 1974), if one's actions seem to be self-validated.

What is the role of "reflection-in-action?"

As noted in our review, the process of reflection in action was specifically described only in studies of practicing professionals (Klemola and Norros 1997, 2001; Pinsky and Irby 1997; Pinsky et al. 1998; Teekman 2000). Studies of students did not involve authentic experiences; i.e., the opportunity to reflect-in-action, but rather involved reflection upon vignettes and surveys of attitudes. A clearer understanding of the nature and role of this aspect of reflection will be important to guide educators.

Does reflection enhance self-assessment?

Although not explored in this review, there appears to be a dynamic relationship between reflective practice and self-assessment, both explicitly and implicitly. The ability to self-assess depends upon the ability to reflect effectively on one's own practice, while the ability to reflect effectively requires accurate self-assessment. In a recent review of the self-assessment literature, Eva and Regehr (2005) explored the possibility that reflection-in-action activities are, in fact, an aspect of self-monitoring and assessment. If this is so, then the importance of developing both abilities is supported. They also note that while reflection-on-action is essential for continuing professional development, "on a day-to-day basis, reflection-in-practice is a substantially more important mechanism for ensuring safe and effective performance.... Largely ignored in the current self-assessment literature are questions of whether or not individuals accurately reflect-in-practice" (p. 551). It may be beneficial to treat reflective practice, like self assessment, as being "not a stable skill, but ... a situationally bounded cognitive process that is context specific and dependent upon expertise" (p. 553). If this is the case, then both of these key professional activities would benefit from being considered and explored together.

Does reflection alter clinical behaviour?

We found no studies which measured change in clinical practice as a result of, or associated with, reflection. This question will be difficult to explore as reflection tends to be a non-visible activity; however, an improved understanding of its component parts and its relationship to enhanced practice will help to guide educational efforts.

Does reflection improve patient care?

We found no evidence in this regard. This is not surprising; after all, we do not yet have evidence of differences in quality of care provided by reflective and non-reflective

practitioners. However, awareness of uncertainty and validation of assumptions are part of reflective practice and might theoretically have the potential to improve patient care.

Can reflective practice be taught and learned?

We have some modest evidence that reflective practice can be developed and that improved reflective ability is associated with some learning contexts, and with systematic attempts to develop it. The factors that have been associated with its success appear to be a facilitating context, a safe atmosphere, mentorship and supervision, peer support and time to reflect. More study is needed to determine the most effective strategies for teaching and learning of this complex process.

Are there negative effects of reflection?

There is little research reporting negative effects of reflection. Boud and Walker have identified some challenges of teaching reflection in the health care context, and identified potential negative effects on both the reflective process and by extension, on learners. These include reflection without learning, intellectualizing reflection, and “recipe-following” (Boud and Walker 1998; Boud 1999). As with any intervention, it will be important to understand both the intended and unintended outcomes.

Implications for educational practice

While the literature is still early in development, and not conclusive, we offer the following implications for educational practice that educators may consider:

Reflection may be most useful when viewed as a learning strategy. Used in this way, it may assist learners to connect and integrate new learning to existing knowledge and skills. Reflection may also assist learners to explicitly integrate the affective aspects of their learning. This may be particularly beneficial in the clinical learning environment, where many aspects of the professional role are experienced and learned.

Reflection, and its role in learning, may not be obvious to learners; it may also be a tacit process in experienced practitioners. An important task for teachers may be to model reflection on their own practice; i.e., to make their own reflective activities explicit. Further, including learners and inviting their contribution may demonstrate that reflection can be a collaborative, as well as an individual, experience. Experience with collaborative reflection may be important as a preparation for participation in interprofessional teams, where the ability to consider the cognitive approaches and values underlying the work of other professionals is important (Clark 2006).

As with other skills, learners may need a structure to guide this activity, especially early in their learning. They may require feedback on both the content and the process of their reflection, both “reflection-in-action” and “reflection-on-action.” Reflection offers an opportunity to consider one’s strengths and weaknesses, and to determine learning needs. Learners and teachers may be able to use reflection as one element of self-appraisal, encouraging learners to seek evidence and input to validate and enhance their own judgements.

The literature suggested repeatedly that guidance and supervision are key to reflection and are factors that learners perceived to be beneficial to their learning. Therefore, as educators, we will want to ensure that when reflection is used as a learning strategy, the process is guided appropriately.

The environment for teaching and learning about reflection will be important. If the culture and environment do not value and legitimize this learning strategy, reflection may not be used, potential benefit may be lost, and negative reflective experiences may result.

A key assumption underlying the literature on reflection is that it will enhance competence. As noted, to date there is no evidence to support or refute that assumption. Such a finding may suggest to some that attempts to teach reflection are fruitless, and should be abandoned. We would, however, propose that continued study of reflection and its effect on professionals and on professional practice is important and worthwhile. The existing literature reveals that professionals reflect, albeit in different ways, and to different degrees. It also suggests that there may be improvements to learning and to learning from experience associated with reflection. If these relationships can be clarified, it is plausible to suggest that practice may ultimately benefit and the benefit may be transferred to patients. No educational strategy will provide a panacea for the challenges of professional practice; however, reflection may be a strategy, a 'habit of mind' (Epstein and Hundert 2002) that can serve certain practitioners well, in certain situations. If appropriately used, we found no evidence of harm in using this strategy. At the very least, this would place reflection on an equal footing with other strategies to enhance learning.

Conclusion

In this review, we have synthesized the findings of 29 studies of reflective practice in the health professions. While the literature is early in its development, certain findings were quite consistent across professions and levels of learners. The very nature of reflective practice makes its quantification challenging. Yet, as understanding of reflection develops and the field matures, there will be a need for studies with rigorous designs that will allow us to evaluate the effect of different educational strategies to promote its development. Creative and disciplined application of a range of study designs and methods will be required to effect this next stage of understanding this element of practice.

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Appendix

Appendix 1 Studies included with abstract

Source	Study design & data collection	Study population & discipline	Study location	Sample size	Brief abstract
Beecher et al. (1997)	Qualitative content analysis Written & interview	Senior practitioners Medicine	USA	10	Described the use of the effectiveness of the Educators Portfolio as a stimulus for faculty's reflection about educational practice.
Boeninck et al. (2004)	Observation cross section Vignette	Undergraduate Medicine	Netherlands	195	Described the development of an instrument to measure the ability of medical students to reflect on their performance in medical practice.
Burnand (1995)	Qualitative content analysis Interview	Senior practitioners Nursing	UK	12	Nurse educators from various teaching institutions were interviewed about reflection and reflective practice.
Dorman et al. (2002)	Quasi-experimental Questionnaire	Senior practitioners Medicine	UK	95	Measured the uptake and use of an electronic learning portfolio to support reflective continuing professional development and to characterize attitudes towards its use and obstacles to its adoption.
Duke and Appleton (2000)	Observational cross sectional Portfolio	Undergraduate and senior practitioners Nursing	UK	62	Tested that the ability to reflect is developmental and that some reflective skills are harder to achieve than others.
Francis et al. (1998)	Qualitative Portfolio & Interview	Undergraduate Nursing	Australia	14	Examined the change in philosophies of nursing perceived by three university based educators and their students.
Glaze (2001)	Qualitative Interview & Observation	Postgraduate Nursing	UK	14	Explored students' perceptions of reflection following completion of modules, to evaluate their experiences and inform curriculum development.

Appendix 1 continued

Source	Study design & data collection	Study population & discipline	Study location	Sample size	Brief abstract
Gustafsson and Fagerberg (2004)	Qualitative phenomenology Interview	Senior practitioners Nursing	Sweden	4 (×2)	Explored the implications of the nurses' reflections, what they reflect about, and how they deal with their reflections.
Hallett (1997)	Qualitative phenomenology Interview	Undergraduate and senior practitioners Nursing	UK	26	Interviewed student nurses and supervisors about the usefulness of reflective practice in their practices.
Kember and Leung (2000)	Qualitative content analysis Questionnaire	Undergraduate Health Sciences	Hong Kong	303	Reported the development and testing of an instrument which determines whether students engage in reflective thinking, and, if so, to what extent.
Klemola and Norros (1997)	Qualitative grounded theory Interview	Senior practitioners Medicine	Finland	16	Explored a new conceptual framework and investigate the possibility of differences in the orientations anaesthetists use in framing the focus of their work.
Klemola and Norros (2001)	Qualitative multi-method Video observation interview	Senior practitioners Medicine	Finland	8	Explored interactions between anaesthetists and patients, or, the anaesthetist's habit of action.
Leung and Kember (2003)	Observation cross sectional Interview	Undergraduate Health Sciences	Hong Kong	402	Examined the association between students' approaches to learning and stages of reflective thinking using the revised version of the study Process Questionnaire and the Reflection Questionnaire.
Mamede and Schmidt (2005)	Questionnaire	Senior practitioners Medicine	Brazil	202	Explored relationships of reflective practice to physician's age, number of years of clinical practice, and practice setting.

Appendix 1 continued

Source	Study design & data collection	Study population & discipline	Study location	Sample size	Brief abstract
Mamede and Schmidt (2004)	Observation cross section Interview	Senior practitioners Medicine	Brazil	202	Described a 5-factor model of reflective practice consisting of: deliberate induction; deliberate deduction; testing and synthesizing; openness for reflection, and meta-reasoning. The model fitted the data sufficiently.
Mantzoukas and Jasper (2004)	Qualitative content analysis ethnography Portfolio	Ward nurses Nursing	UK	16	Explored the issues of implementation of reflection within the daily reality of practitioners, which are frequently overlooked within the literature.
Niemi (1997)	Interview observation Qualitative content analysis Interview Learning Log	Undergraduate Medicine	Finland	110	Explored the ways in which a medical student elaborates his or her personal experiences during the training, and about the way he or she gradually develops a professional identity.
Pearson and Heywood (2004)	Observation cross section Interview questionnaire	Postgraduate Medicine	UK	92	Explored the use of educational portfolios in reflective learning by general practice (GP) registrars.
Pee et al. (2002)	Qualitative content analysis Worksheet Questionnaire	Undergraduate Dentistry	UK	26	Assessed whether students completing a reflective learning activity based on a structured worksheet really were reflecting.
Pinsky et al. (1998)	Qualitative content analysis Questionnaire	Senior practitioners Medicine	USA	48	Surveyed distinguished teachers regarding instructional successes in learning to teach which included reflective practice.
Pinsky and Irby (1997)	Qualitative content analysis Interview questionnaire	Senior practitioners Medicine	USA	20	Identified nine common failures in clinical teaching associated with planning, teaching and reflection.

Appendix 1 continued

Source	Study design & data collection	Study population & discipline	Study location	Sample size	Brief abstract
Platzer et al. (2000)	Qualitative content analysis Interview	Diploma/Post Registration Nursing	UK	30	Explored small groups which enabled students to reflect on and learn from experience.
Sobral (2005)	Psychometric analysis	Undergraduate Medicine	Brazil	275	Examined the measurement properties of the reflection-in-Learning Scale (RLS) and identified whether there are relationships between RLS scores and outcomes of the students academic activity.
Sobral (2001)	Qualitative content analysis Course	Undergraduate Medicine	Brazil	196	Appraised reflection-in-learning in relation to measures of learning orientation, course valuing and academic achievement.
Sobral (2000)	Qualitative content analysis Course	Undergraduate Medicine	Brazil	103	Examined the reflection-in-learning profile of medical students as they started their clinical apprenticeship.
Teekman (2000)	Qualitative content analysis Interview	Senior practitioners Nursing	New Zealand	10	Explored reflective thinking in actual nursing practice.
von Klitzing (1999)	Qualitative content analysis Observation	Postgraduate Nursing	Germany	7	Evaluated the sessions of a psychodynamic group of 7 nurses studied for one year.
Williams and Wessel (2004)	Qualitative content analysis Portfolio	Postgraduate Physiotherapy	Canada	48	Explored feedback from physical therapy students about their learning while studying chronic musculoskeletal conditions, using journals.
Wong et al. (1995)	Qualitative content analysis Journals	Students Nursing	Hong Kong	45	Developed and tests coding systems for written reflective journals based on two well-known models of reflective thinking.

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