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# Contemporary learning techniques for healthcare professionals: A narrative review

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**Background:** As medical knowledge continues to expand at an accelerated rate, healthcare professionals face a significant challenge in remaining up-to-date. The goal of this narrative review was to present evidence-based learning strategies that could aid postgraduate clinical education.

**Design:** Articles were sought for using PubMed, Ovid, PsychINFO, ERIC databases and only included if relevant to the review objective.

**Results:** A total of 103 articles, chapters, and books were used to compose this narrative review. An additional 135 articles and chapters were examined in full for context. The review is divided into two sections: (1) strategies that can help foster a learning mind-set; and (2) high-yield practical tools that are effective in formal or informal learning domains.

**Conclusion:** Individual learning is a cornerstone of clinical performance, which influences the quality of care that one can deliver. This review offers a comprehensive set of learning tools for individuals across a variety of settings.

KEYWORDS

medical education, postgraduate, learning theory, continuing professional development, learning skills

## Introduction

By the end of 2020, the "doubling period," defined as the time taken for the total amount of medical knowledge to double, shortened to just 73 days (Densen, 2011). It is a challenge for clinicians to remain up-to-date with this growing body of information, whilst maintaining a busy clinical practice.

Indeed, the time and resources required for healthcare professionals to digest and employ such information in clinical practice are lacking. To meet imminent healthcare demands, service provision is frequently prioritised over workplace learning (Dornan, 2012). Healthcare professionals face various profession-specific challenges that can make workplace learning difficult. These include: changing patterns of shift work, the physical

and emotional burdens of caring for sick patients, administrative responsibilities, and the inconsistent quality and quantity of employer-provided educational opportunities.

If we wish to assimilate and apply new knowledge, we need to develop effective and time-efficient learning skills. Unfortunately we are often ill-prepared to develop new learning methods for clinical practice after graduation (Brown et al., 2007), despite the potential for such methods to impact on our performance (Marsick and Watkins, 2001), and the organisations we work in (Senge, 1991). Learning skills nurtured in university may be inappropriate or unsuitable in healthcare contexts (Tynjälä, 2008; Demiroren et al., 2021). For example, the skills required to engage with a lecture are different to the skills required to distil practical learning points from a ward-round. Learning strategies that are adapted to environments where "formal" learning opportunities are scarce are urgently needed.

Much attention has been given in the educational literature towards improving the environment in which we learn (Spouse, 2001). Organisational factors such as the institutional customs and values, characteristics of the practice environment, subspeciality of the professional and characteristics of their set of patients can readily influence learning behaviour and professionalism (West and Shanafelt, 2007). In contrast, methods that encourage cognitive and knowledge-based learning at an individual level are often neglected. This narrative review attempts to meet this demand, and do so with minimal technical jargon. General strategies are first presented that would enable us to foster a successful learning mindset in the workplace. Practical, high-yield learning tools and enhanced technological solutions which can aid our ongoing medical education are then outlined.

## Design

Journal articles (original retro- or prospective studies, technical notes and reviews) and book chapters were identified using PubMed, Ovid, PsychINFO, ERIC, and other medical and non-medical databases. Search parameters included combinations of: "workplace-learning"; "life-long learning"; "continued professional development" OR CPD OR "continuing medical education" OR CME and "self-directed learning." Combinations of medical subject headings (MeSH) corresponding to the search parameters were also used. English-only articles were sought and could be related to any healthcare discipline. The principal focus of this review was to narrate learning strategies focused on improving information gathering and learning methods in the workplace.

The search was performed on January 10th 2022, and repeated 3 months later to ensure newer articles were not missed. Using related references from the initial search data and subject matter experts, additional literature was identified. Using the search terms above, approximately 1,100 titles and abstracts were screened, of which 135 articles and book chapters were examined in full for context. This included literature related to learning theory, undergraduate education and workplace learning in other industries. A total of 103 articles, chapters and books were included and have been used to compose and support this narrative review. Articles were only included if relevant to the objectives, and were excluded if related to technical skills. Articles focused on communication skills and other soft skills, while equally important, were excluded for this review as they were not part of the intended study objective.

## Results

## Developing a learning mind-set

### What are my learning drivers?

The General Medical Council states in "Good Medical Practice, Domain 1: Knowledge, skills and performance" that "we must keep our professional knowledge and skills up to date; we must regularly take part in activities that maintain and develop our competence and performance" (General Medical Council, 2020). Similarly, the Nursing and Midwifery Council state we must "keep our knowledge and skills up to date, taking part in appropriate and regular learning and professional development activities that aim to maintain and develop our competence and improve our performance" (Nursing and Midwifery Council, 2018). Yet the majority of clinicians find their contractual obligation to engage in life-long post-graduation learning to be an ineffective learning driver.

Why is it important to recognise our learning drivers? Knowledge of why we want to learn provides insight into our learning processes and how best to enjoy the learning. Being aware of our learning drivers, even superficial ones, can help internalise learning motivation, and help learning to become a conscious choice rather than an external obligation (Deci et al., 1991).

Each individual likely responds well to different learning drivers (Table 1). External drivers reward completed learning. For example, learning *via* formal appraisals and faculty examinations (General Medical Council, 2012) are often rewarded with career progression. Although examinations can drive learning (Wormald et al., 2009), such learning can be superficial in nature–geared only towards passing the assessment (McLachlan, 2006), and can fail to provide long-term knowledge retention and behavioural change. Internal drivers are allied to our desire for autonomy, sense of curiosity, and educational values. Individuals' optimal development, according to self-determination theory, result from actions motivated by intrinsic interests rather than external reinforcements (Deci et al., 1991). There is evidence to suggest that the greater the influence of our internal motivating drivers, the more likely we

are to succeed academically and keep up-to-date (Abrahamson et al., 1999; Snelgrove and Slater, 2003).

Perhaps the most important driver to consider is our attitude towards learning itself, and whether we have accepted responsibility for our own professional development (Ericsson, 2004; Teunissen and Dornan, 2008). Whilst all regulated healthcare professionals are involved in continuing professional development (CPD) activities, these should not be viewed as isolated one-off activities (Stinson et al., 2009). Commitment to being a lifelong learner is central to individual development, and is associated with a wide range of personal and professional benefits (Laal and Salamati, 2012). Research in continuing medical education shows that doctors learn most when they are motivated to identify their own learning needs, and meet those needs at their own pace (Mazmanian and Davis, 2002).

## What are my learning needs?

Identifying one's specific learning needs represents a fundamental aspect of self-directed learning in workplace medicine (Fox and Bennett, 1998). The more explicitly these are articulated, the more likely effective learning will take place (Knowles, 1973). But how do healthcare professionals know what they need to know?

Healthcare workers generally have professional curricula, appraisal, and CPD requirements which represent a template upon which to accrue knowledge and gain competencies. However, learning objectives only offer a narrow view of what is required (Grant, 2002) and shift the focus to be able to work competently and independently, rather than to achieve clinical and personal excellence. Additionally, we have limited insight into our own learning needs, and so this should be done with the support of educational supervisors. Recognising the multitude of sources to stimulate learning, and that feedback and guidance are available from mentors, peers, and patients is key (Walsh, 2006). Below, we present a succinct framework to assess learning needs (**Figure 1**), according to their source, i.e., whether they are instigated by ourselves or by interactions with others. Here, learning needs are shown to be on a spectrum: from an essential

knowledge or skill gap that must be filled, to an opportunity for greater competence, autonomy, and clinical excellence. For a more extensive list, please see *The Good CPD Guide* which outlines over 40 different methods of assessment (Walsh, 2006; Grant and Zilling, 2017).

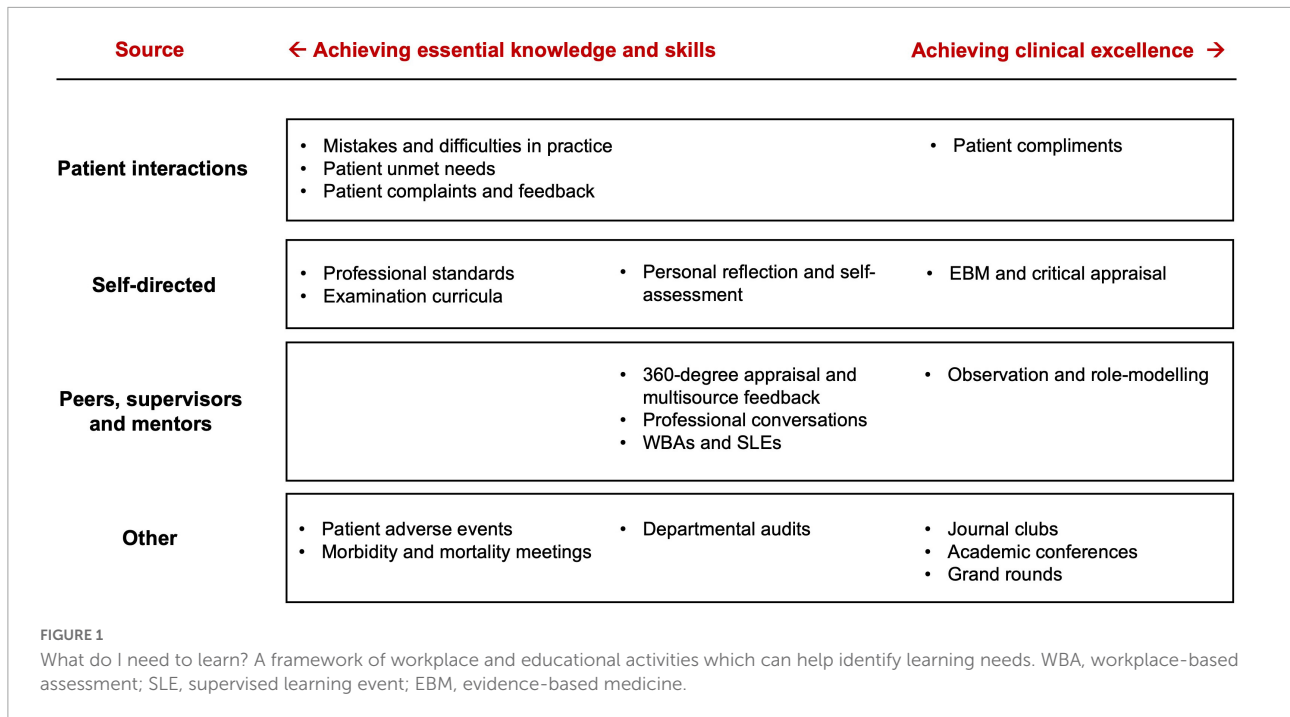## Embracing an active, reflective learning mind-set

As students we were in an enviable position, in which it was socially acceptable *not* to know things. We were encouraged to be curious, to ask questions, clarify doubts, to seek feedback, and to further our interests (Dyche and Epstein, 2011). In other words, we were encouraged to pursue an "active learning mindset." Now as health care staff, patients and their families often expect us to behave with absolute certainty (Teunissen and Dornan, 2008). One may feel compelled to hide any uncertainty, for fear it may cause a loss of trust and confidence. The heavy demands of the clinical working day can often lead to negative mental states such as "hurry-up syndrome" and cognitive "overload" (McElhatton and Drew, 1993). Consequently, we can unconsciously switch off to learning during interactions or any activity not clearly signposted as learning. If our mindset remains fixed in this way, not only is our capacity for learning stunted, but may be associated with maladaptive cognitions and stress (Ding et al., 2019). Fortunately, this fixed mindset can be changed (Dweck, 2017).

If we feel overloaded, a simple method can be to take a short pause, even as brief as 10 s (Rall et al., 2008), to interrupt our current mental state, reframe our present experience, and enhance learning (Lee et al., 2021). This can be useful when dealing with unexpected events, anticipating difficult ones, and during long, attentionally-demanding tasks (Vesta and Smith, 1979; Ruhl et al., 1987; Moulton et al., 2010; Lee et al., 2021).

All clinical encounters have the potential to stimulate curiosity and desire to learn, but do require active participation. Active learning is defined as any instructional activity "that involves students doing things and thinking about the things

TABLE 1   Internal and external motivations for individual learning.

|          | Learning driver | Description |
|----------|-----------------|-------------|
| External | Examinations | Royal college and professional societies' written and practical examinations, taken at interim stages of training |
|          | Appraisals and revalidation | Learning for the purpose of meeting departmental assessments and completing professional obligations |
|          | Professional incentives | Learning with the aim of obtaining a higher-banded role or a financial reward |
|          | Institutional culture | Learning stimulated by an enthusiastic and open learning culture focused on education and improving clinical care |
|          | Teaching and mentoring | Learning for the purpose of delivering teaching content and/or to commence a mentorship role |
|          | Adverse-event anxiety | Learning provoked by adverse incidents to prevent re-occurrence |
| Internal | Improving competence and autonomy | Learning provoked by the desire to feel proficient and independent in daily activities |
|          | Intellectual curiosity | Learning stimulated by the natural inclination to answer questions and fill-in knowledge gaps |
|          | Learning attitudes and habits | Learning stimulated by the values and behaviours regarding life-long learning |
|          | Self-concept and innate skill | Learning provoked by prior experience of a particular subject, which can increase the motivation to learn more |

| Source | ← Achieving essential knowledge and skills | | Achieving clinical excellence → |
|---|---|---|---|
| **Patient interactions** | • Mistakes and difficulties in practice<br>• Patient unmet needs<br>• Patient complaints and feedback | | • Patient compliments |
| **Self-directed** | • Professional standards<br>• Examination curricula | • Personal reflection and self-assessment | • EBM and critical appraisal |
| **Peers, supervisors and mentors** | | • 360-degree appraisal and multisource feedback<br>• Professional conversations<br>• WBAs and SLEs | • Observation and role-modelling |
| **Other** | • Patient adverse events<br>• Morbidity and mortality meetings | • Departmental audits | • Journal clubs<br>• Academic conferences<br>• Grand rounds |

FIGURE 1
What do I need to learn? A framework of workplace and educational activities which can help identify learning needs. WBA, workplace-based assessment; SLE, supervised learning event; EBM, evidence-based medicine.

they are doing" (Bonwell and Eison, 1991) and involves efforts to "actively construct knowledge" (Carr et al., 2015). Graffam (2009) describes active learning being made up of three interrelated components: engagement, observation, and reflection. Engagement is influenced by our degree of participation, it is also dependent on our attentional state (Torralba and Doo, 2020). Attention can be recruited by recalling prior knowledge and experience, creating an "educational scaffold." This allows learning to be both contextual and meaningful (Torralba and Doo, 2020). After a clinical interaction, we can reflect critically to identify ways in which we could have improved, acted differently, or acknowledge what we found particularly interesting. Such reflection can prompt curiosity, and engage learning motivation (Ménard and Ratnapalan, 2013; Eve, 2020). A practical way to maintain a learning mind-set is to keep a real-time diary of topics or observed problems that require clarification. Later, when we have an opportunity to talk with a colleague or access medical resources, we can fill-in the previously identified knowledge gaps.

## Learning, energy, and well-being

Despite possessing an effective skill set, if we are sleep-deprived, under-nourished and stressed, learning will be a challenge. Eating a balanced, healthy diet, and ensuring one is sufficiently rested are beneficial for learning and memory (Stickgold et al., 2001; Dani et al., 2005; Gais et al., 2006).

The hours in a day is a finite resource, but the level of our personal energy and motivation has the capacity for renewal (Schwartz, 2007). Energy levels fluctuate during the day, and

it may be difficult to study in the limited time period after a clinical shift. Practically speaking, we should cultivate habits to maintain stamina during the shift so as not to be bereft of energy afterwards. Such habits might include taking regular breaks, to utilise breaks to completely disengage from clinical activity (such as going for a short walk off the ward or outside), eating smaller, more frequent meals, and keeping hydrated (Oliver, 2020). We should try to capitalise on business-day-period learning opportunities, such as ward rounds, clinics, and meetings (see Section "Non-formal and informal learning").

Burnout, occupational stress, and mental health are well-known amongst healthcare professionals (Vijendren et al., 2015) and are associated with decreased patient safety and professional performance (Hall et al., 2016). Stress negatively affects how we learn and remember (Vogel and Schwabe, 2016), whereas feeling relaxed and attentive positively affects cognitive performance. Although it is beyond the scope of this review to offer a comprehensive account of how to manage workplace stress, a simple practice is the use of slow, deep, diaphragmatic breathing to diffuse negative emotional states such as anxiety, impatience, or frustration (Loehr and Schwartz, 2003; Schwartz, 2007; Hopper et al., 2019). Paced breathing has been shown to enhance working memory and motor skill acquisition (Khng, 2016; Yadav and Mutha, 2016). For more lasting positive psychological change, cognitive behavioural therapy and mindfulness-based interventions as stress-reduction techniques have shown particular benefit for healthcare professionals (Vogel and Schwabe, 2016; Clough et al., 2017).

# Learning tools

## Formal learning

Formal learning typically constitutes a structured program in which set objectives (typically designated by an institution) are met through discrete learning experiences. It entails didactic teaching in the classroom or lecture theatre, induction courses, virtual webinars, and e-learning. Below, we outline a set of evidence-based skills useful in formal learning contexts (Dunlosky, 2013; Sumeracki and Weinstein, 2018) and provide relevant programs and links (Table 2).

*Active note-taking* describes the process of recording information from teaching sessions for storage and to aid personal encoding. The effectiveness of note-taking can be enhanced by adding material of personal relevance, linking with concrete examples, annotating, and highlighting points of importance, and creating summaries (Hartley and Davies, 2006). *Spaced repetition* is essential to meaningful learning and retention. Opportunities to re-study learning materials can consolidate understanding and help identify educational gaps (Ausubel and Youssef, 2010). Electronic flashcard applications can prompt repetition, with timing based on algorithms that enhance recall by both distributing and interleaving learning sessions (Wozniak and Abramowicz, 1997). *Active reading*

uses elaborative interrogation and self-explanation to increase our engagement with reading materials, and are of particular use given the vast amount of written information healthcare staff are exposed to. One well-known active reading system is Robinson's "SQ3R." This system requires readers to sequentially survey, question, read, recite, and review reading materials (Robinson, 1970). *Mind-maps* are network diagrams that organise information and identify relationships (Buzan, 2018). The use of mind-maps increase information retention, integrate clinical thinking, and facilitate problem solving (Noonan, 2013).

## Non-formal and informal learning

Non-formal learning constitutes learning that occurs outside of a set curriculum, but is organised in some way. Informal or incidental learning is defined as self-directed learning that has no organisational intention, and is frequently embedded within the work environment. It has been described as "unstructured, unintended, and opportunistic" (Yardley et al., 2012) and can comprise up to 80% of workplace learning (Cross, 2007). Outlined are non-formal and informal learning activities that healthcare professionals frequently participate in, and tips on how to maximise their utility (Table 3).

Many clinicians have been exposed to reflective learning through written experiences in portfolios, but these are often mandated for appraisal and can become a check-box exercise. *Personal reflection* is essential to the development of expert, life-long learners (Davis et al., 2014) and is one of the most important tools for generating behavioural change. It can help clinicians increase awareness of their understanding, and how they can integrate new skills (Ertmer and Newby, 1996). Although it is important to reflect on errors, it is equally important to recognise when things have gone well. If time is short, reflections can be done rapidly using voice recordings, a reflective selfie, or a brief note written contemporaneously to capture an experience (Grant et al., 2017).

The *apprenticeship* model remains an important part of clinical education despite the demands of the modern postgraduate environment. An apprentice is shown how to perform their role by an expert, and is assisted before becoming fully independent (Sheehan et al., 2010). An academic coach can help the learner in all stages of the learning cycle: to identify learning needs, facilitate goal setting and accountability, and to assess and contextualise learned skills and knowledge. Experts have a vast wealth of tacit knowledge which the apprentice can learn through observation and role-modelling (Eraut, 2000; Rassie, 2017).

*Evidence-based medicine* (EBM) has become the approach of choice in appraising, assimilating, and applying new published evidence in modern healthcare. Developing a research question using the population-intervention-comparison-outcome (PICO) format, and establishing the validity and relevance of the derived information remains central (Swanson et al., 2010), but this is time-consuming and ill-suited at the bedside. For

TABLE 2 Formal learning tools and links to useful software and references.

| Learning tool | Useful apps and links |
| --- | --- |
| Active note-taking | Evernote, http://evernote.com/ (Web, macOS, Windows, iOS, Android) |
| | Microsoft OneNote, https://onenote.com/ (Web, macOS, Windows, iOS, Android) |
| | Google Keep, https://keep.google.com/ (Web, Chrome, iOS, Android) |
| | Notion, https://www.notion.so/ (Web, macOS, Windows, iOS, Android) |
| | Apple Notes, https://www.apple.com/app-store/ (Web/macOS/iOS) |
| Spaced repetition | Anki, https://apps.ankiweb.net/ (Web, macOS, Windows, iOS, Android) |
| | Quizlet, https://quizlet.com/ (Web, iOS, Android) |
| | Cram, https://www.cram.com/ (Web, iOS, Android) |
| Active reading | Robinson method of reading comprehension, https://en.wikipedia.org/wiki/SQ3R (Robinson, 1970) |
| | The "PQRST" method of studying, https://www.nbss.ie/node/209 (Wilson and Moffat, 2014) |
| Mind-maps | Coggle, https://coggle.it/ (Web) |
| | XMind, https://www.xmind.net/ (macOS, Windows, iOS, Android) |
| | MindMeister, https://www.mindmeister.com/ (Web, macOS, Windows, iOS, Android) |
| | Mindomo, https://www.mindomo.com/ (macOS, Windows, Android) |

this reason, focusing on a select number of questions that are most important in one's practice is suggested (Slawson and Shaughnessy, 2005). Two methods can make EBM-related practices easier. First, critical appraisal of primary literature can be done in small groups or journal clubs where the workload can be shared. Journal clubs enable postgraduates to keep up to date of new research findings, to enhance their critical appraisal methods, and facilitate greater contextual understanding than what may be achieved alone (Ebbert et al., 2012). Second, software can retrieve relevant and valid evidence automatically (Table 3).

Accessing *evidence at the point-of-care via* pre-synthesised sources, during or after ward-rounds or consultations, enables evidence-based, patient-orientated decisions to be made quickly and shortens the gap between the identification and fulfilment of a learning need (Slawson and Shaughnessy, 2005). Nowadays, guidelines and digestible "best-practice" information are readily accessible *via* the use of smartphones without having to perform extensive critical appraisal.

*Workplace based assessments* (WBAs) and *supervised learning events* (SLEs) include structured case-based discussions and directly observed procedures. WBAs can promote

self-directed learning (Liu, 2012). Learners must apply critical thinking and decision making, and independently formulate a plan or demonstrate clinical and procedural competencies. There are a number of concerns with regards to their implementation, including a lack of clarity about their purpose and the quality of trainer feedback (Massie and Ali, 2016). While much of the onus to deal with these shortcomings will be on assessors and institutions, learners can be more assertive and see WBAs as more than just another hoop to jump through.

Our daily professional learning environment is dominated by discussions of patients and practice (Grant and Zilling, 2017) ranging from case discussion within multidisciplinary meetings to informal conversations in the coffee room. *Peer discussion*, by engaging in impromptu conversations with colleagues, can digest clinical experiences and clarify difficult topics. In a more organised way, peer-associated learning can be an effective method for postgraduate education (Lockspeiser et al., 2008; Thampy and Kersey, 2017). Peers can better understand the needs of their fellow learners and facilitate a more informal, non-threatening environment in which to learn (Lockspeiser et al., 2008; Thampy and Kersey, 2017).

TABLE 3  Non-formal, informal, and incidental learning tools.

| | Learning tool | Tips and links |
|---|---|---|
| Towards non-formal ↑ | WBAs and SLEs | Trainees generally find face-to-face evaluation and verbal assessments most useful. Be brave: seek specific, timely, and constructive feedback (Algiraigri, 2014) and avoid seeing assessments as a summative tick-box exercise (Massie and Ali, 2016) |
| | Coaching and apprenticeship | Rangachari et al. (2016) suggest the following mnemonic ("DIRECT") for apprentices to receive effective coaching, summarised below:<br>**Decide/Identify** specific areas for coaching<br>**Reflect** upon one's performance in these areas; use specific examples<br>**Elicit** input from coach by sharing your reflections then asking for input<br>**Clarify:** input from coach where ambiguities exist<br>**Translate** into action with a coach to identify actionable items, develop specific goals, and plan for follow-up. |
| | EBM: staying up-to-date | Staying up-to-date with current research can be made more efficient with automatic literature alerts from specific databases. Commonly used alert systems include:<br>Stork, https://www.storkapp.me/ and<br>Pubcrawler, http://pubcrawler.gen.tcd.ie<br>PubMed, https://www.nihlibrary.nih.gov/resources/subject-guides/keeping-current/creating-alerts-pubmed |
| | EBM: at the point-of-care | Accessible, expertly curated best-practice sources include:<br>BMJ Best Practice, https://bestpractice.bmj.com/ (Web, iOS, Android)<br>UptoDate, https://www.uptodate.com/ (Web, iOS, Android)<br>DynaMed, https://www.dynamed.com/ (Web, iOS, Android)<br>Evidence suggests that patients are supportive of the use of digital devices for clinical decision support, providing an explanation of the rationale is given (Patel et al., 2015). |
| ↓ Towards informal and incidental | Personal reflection | Several frameworks are available to facilitate personal reflection. One of the most simple and popular is the Driscoll model (Driscoll, 2000), which contains three elements of reflection:<br>**What?**–A description of the event<br>**So What?**–An analysis of the event<br>**Now What?**–Proposed actions following the event |
| | Peer discussions | Many staff are happy to explain aspects of particular cases. Such discussions may occur during ward rounds, when making referrals, or during multidisciplinary meetings. It is important that we proactively seek such discussions and the new information they expose us to. |
| | Social media | Healthcare organisations, speciality leaders, and journals often have social media accounts that provide regular follower alerts regarding events and updates in research fields. |

*Social media* platforms (Twitter®, Facebook®, WhatsApp®) provide extensive opportunities to foster collaborative learning and engagement from any internet-capable device (Cheston et al., 2013; Jalali et al., 2015). Knowledge sharing on news feeds is particularly useful as a communication medium for healthcare-related updates (Jalali et al., 2015; Jeong and Jalali, 2019). Speciality-specific online forums can be used to discuss difficult cases anonymously, and to learn from the experiences of others (Woods et al., 2019). Media-sharing platforms including Youtube® and audio podcasts offer an almost encyclopaedic amount of contemporaneous educational material. The quality is limited by the knowledge of those creating the content, and is generally not peer-reviewed. To help overcome some of these shortcomings we curate a list of postgraduate-focused podcasts, well-rated by online users (see **Supplementary material**).

## Building a personal learning strategy

The ways in which individuals learn new knowledge can differ dramatically. Learning depends on a variety of factors including personality, how we process information (Hayes and Allinson, 1994), subspeciality (Curry and Adams, 1991), and prior experiences (Fleming, 2001). Finding a workplace learning strategy that embraces the above and allows us to assimilate and recall critical information is an iterative endeavour. It may take several attempts before finding clinical opportunities that we readily engage with and facilitate effective learning. Generating a workplace personal development plan (PDP) may generate goals which address learning needs. However, they can be rigid and time-limited, may not factor our capacity for informal learning or learning preferences, or take into account the time and energy resources we have available (Jennings, 2007).

While the evidence for individual learning styles remains inconsistent and controversial (Lujan and DiCarlo, 2006; Samarakoon et al., 2013; Kirschner, 2017; Husmann and O'Loughlin, 2019), it is more likely that we engage with, and learn more effectively during, some activities rather than others. If we know our preferred learning strategy, we can select strategy-specific activities to improve our overall learning efficacy. We need to be aware that activities that are less compatible with our preferred learning strategy, will require greater attention and effort. Enhancing our PDP with this information is likely to bring about more effective learning. Following an analysis of a national survey of paediatric residents, Li et al. (2010) proposed a useful paradigm to help achieve learning goals and promote self-directed lifelong learning within a learner's PDP. The model can be remembered as the mnemonic "ISMART" (Important, Specific, Measurable, Accountable, Realistic, and on a Timeline). Given the information provided in this review, we elaborate on aspects of their model (**Table 4**).

Common to all effective learning strategies is the reinforcement of knowledge by application in the clinical

TABLE 4 A paradigm for achieving learning goals.

**Important**
- Choose relevant goals in line with learning needs and drivers*
- Prioritise achievement of learning goals

**Specific**
- Break broader goals into incremental steps
- Plan how to accomplish incremental steps by choosing appropriate formal and non-formal learning tools*

**Measurable**
- Set a measurable outcome

**Accountable**
- Use a reminder and tracking system
- Build in external accountability
- Establish internal accountability

**Realistic**
- Create achievable goals accounting for personal resources
- Seek out and use available opportunities including informal and incidental learning activities*
- Self-adjust, acknowledging which learning activities are particularly high yield*

**Timeline**
- Develop a timeline for achieving goals
- Incorporate goals into daily routine

Adapted from Li et al. (2010). *Indicate further elaborations based on this review.

environment, incorporating this learning into "daily routine" (**Table 4**). Learning in this way mirrors many of the processes required to become a "Master Adaptive Learner" (Cutrer et al., 2018). To help offer the reader practical ways to assimilate the content of this narrative review, we describe several case scenarios regarding clinicians at various stages of training all of whom have the common desire of improving their learning and the strategies and tools used in each case (see **Supplementary material**).

## Discussion

This review offers a comprehensive palette of learning tools across a variety of settings and although intended for healthcare postgraduates, students of different disciplines may also find value. Common factors are identified that contribute to positive learning outcomes in formal and informal learning contexts.

This review is however, not without limitations. First is the contemporary nature of some of the resources cited. While attempts have been made to "future-proof" the methods cited, materials including podcasts and types of work-based assessment are likely to change with time. Second, it is likely that further review of other non-medical databases would have identified other useful, relevant learning methods. Third, the review lacks depth in certain areas, in order to provide the reader with a broad armamentarium of tools which, if suitable, can be explored in greater detail.

Technical innovation and changes in healthcare delivery will continue to occur [12], and therefore lifelong learning should be at the core of our thinking (Gopee, 2005; Teunissen and Dornan, 2008). Healthcare staff need to be motivated to learn, and to actively engage with the learning process by recognising their learning drivers and needs. One must assimilate and apply new information in clinical practice contexts.

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The author declares that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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## Supplementary material

The Supplementary Material for this article can be found online at: https://www.frontiersin.org/articles/10.3389/feduc.2022.939809/full#supplementary-material

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