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Making research relevant: if it is an evidence-based practice, where's the practice-based evidence?

Lawrence W Green

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The usual search for explanations and solutions for the research-practice gap tends to analyze ways to communicate evidence-based practice guidelines to practitioners more efficiently and effectively from the end of a scientific pipeline. This examination of the pipeline looks upstream
10 for ways in which the research itself is rendered increasingly irrelevant to the circumstances of practice by the process of vetting the research before it can qualify for inclusion in systematic reviews and the practice guidelines derived from them. It suggests a 'fallacy of the pipeline' implicit in one-way conceptualizations of translation, dissemination and delivery of research to practitioners. Secondly, it identifies a 'fallacy of the empty vessel' implicit in the assumptions underlying common characterizations of the practitioner as a recipient of evidence-based guidelines. Remedies are proposed that put emphasis on participatory approaches and more
15 practice-based production of the research and more attention to external validity in the peer review, funding, publication and systematic reviews of research in producing evidence-based guidelines.

[AQ2]

[AQ3] Introduction

The blame for gaps between science and practice falls variously on the stubbornness of the practitioners insisting on doing it their way, their hubris in believing they know their patients best and the smugness of scientists believing that if they publish it, practitioners
25 will use it. None of these characterizations of the culprits is entirely fair, but they and yet others share in the blame. The diagnosis of the gap (even 'chasm'¹) is not in doubt, with a proliferation of government agencies² and university research centres³ dedicated to closing it with better translation and dissemination. But the aetiology and prognosis remain contested, and most of the remedies tried—from continuing education to evidence-based practice guidelines—have
30 been disappointing.⁴ Setting aside the culpability of practitioners in resisting some scientific evidence that they ought to be applying, this commentary examines specific limitations of the evidence itself and how it is produced in accounting for the gap. The main
40 question that it seeks to answer is why, with the growing volume and apparent quality of evidence, would practitioners seem to be resistant to using it more assiduously?

The 'pipeline' fallacy of transferring research to practice

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What appears most frequently as an implicit assumption underlying much of the writing about knowledge translation or transfer, research dissemination and the adoption, utilization and implementation of evidence-based guidelines is the characterization of a pipeline
50 in which evidence is produced and delivered to practitioners. Figure 1 renders the pipeline as a funnel, which is consistent with the accompanying assumption that much more research will be done than will be usable in practice. This gives the research enterprise
55 license to conduct a wider range of research than necessary for practical purposes. It justifies and is justified by the notions of basic research being valuable as an end in itself without immediate application; many basic research ideas having multiple lines of potential
60 application and discovery research being inherently exploratory and heuristic.

The following critique of the narrowing and vetting process acknowledges that such rigour in the filtering of evidence is fully justified for strictly biomedical interventions where the homogeneity of the pathological mechanisms are well known and the potential for
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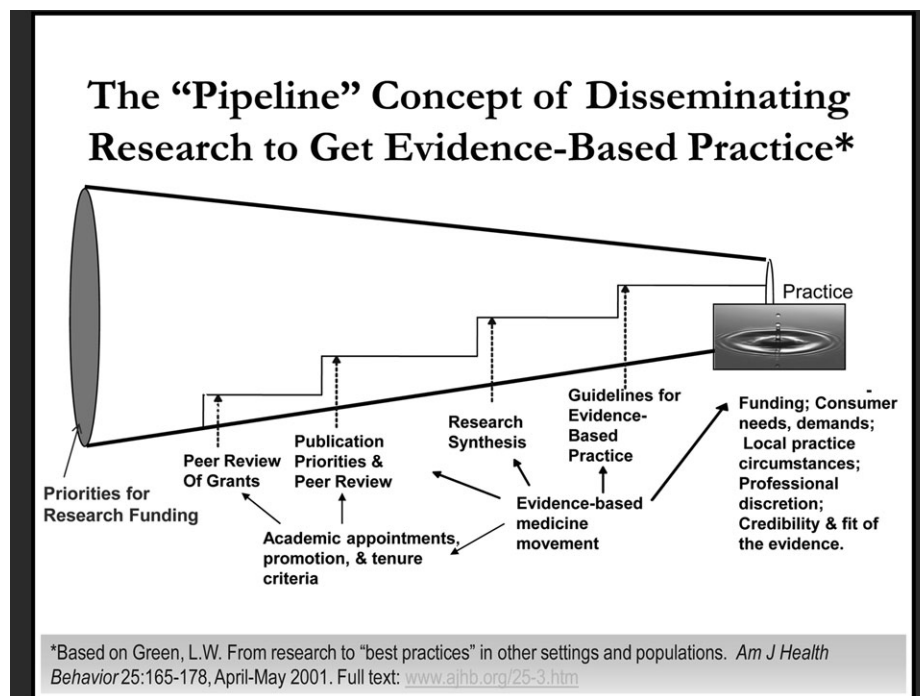


FIGURE 1 The pipeline conceptualization and implementation of transferring research to practice results in successive constrictions of the flow of knowledge and an ‘evidence-based guideline’ product at the practitioner end of the pipeline that has a poor fit with practice circumstances such as funding, time constraints and patient demands

harm with poorly tested interventions is great. For self-care education, patient counselling and other preventive medicine and sociobehavioural interventions, however, the object of interventions is far more diverse in psychological processes, cultural contexts and socioeconomic conditions that may mediate or moderate the relationship between the intervention and the outcomes. For these interventions, context and external validity become as important as experimental control and internal validity.⁵

The narrowing of the pool of research begins with the setting of priorities, often framed as a national ‘research agenda’. The research funded is a subset of that proposed to address the priorities, as whittled down by a peer review or funding agency review process. The research conducted is then successively vetted and filtered through further screenings that narrow the pool through publication, systematic review and synthesis into recommended practice guidelines. An alarming and frequently quoted statement about the total attrition in the funnel and the lapse between research and practice is that ‘It takes 17 years to turn 14 per cent of original research to the benefit of patient care’.⁶

This pair of estimates, attributed to Andrew Balas,⁷ comes from his summing of discursive measures of the leakage or loss from the pipeline at each stage from completed research through submission, publication, indexing and systematic reviews that produce guidelines and textbook recommendations for ‘best practices’, to the implementation of those practices, as

reflected in Figure 2. Changing technologies and priorities of publishing, bibliographic data management, systematic reviews and disseminating evidence-based guidelines would produce different estimates as time passes. But they warrant review for the further specification of which points of intervention in the research-to-practice funnel might be most productive in narrowing the gap between research conducted and used and the time lapses between stages in moving from production to use.

The attrition of some 17% of original research that never gets submitted, usually because the investigator assumed negative results were unpublishable, is particularly disturbing from the standpoint of what practitioners might consider most helpful in their attempts to adapt guidelines for patient or community interventions to their practice circumstances. Negative results of interventions are of interest because they often tell the practitioner about the intervention’s misfit with patients or conditions other than those in which the original research leading to guidelines was conducted. The pipeline approach fails the practitioner here because the literature on which guidelines are based constitutes an unrepresentative sample of the varied circumstances and populations in which the intervention might be usable. Such samples of studies typically favour selection of the highly controlled academic situations in which the studies eligible for systematic review were conducted, giving them an advantage over studies conducted in more typical populations and settings.

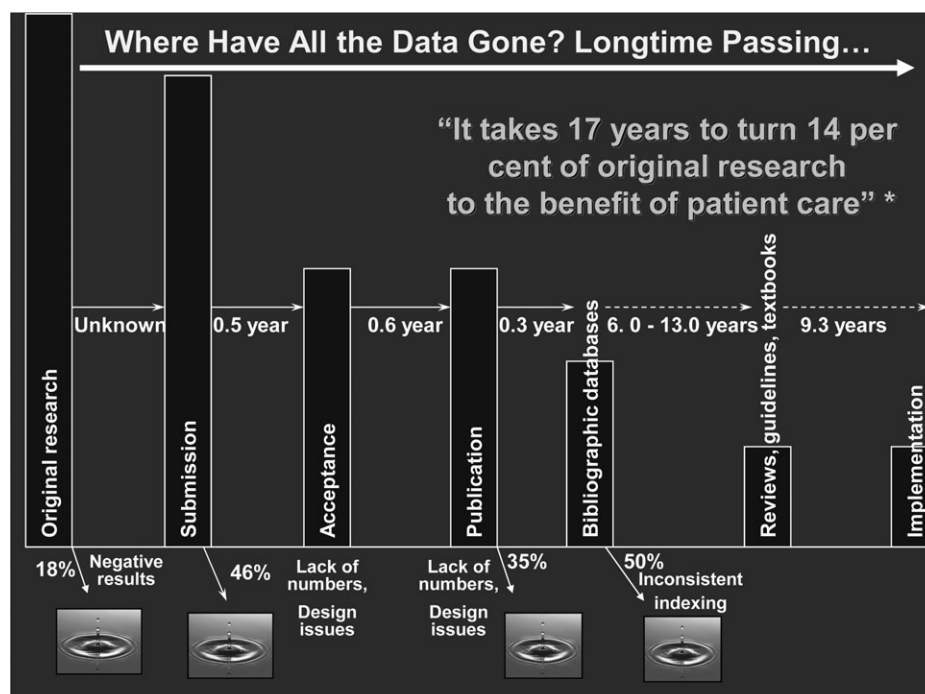


FIGURE 2 The leakage points in the flow of original research into practice and the lag time between points as estimated by Balas from a variety of sources. Source: based on data reviewed and summarized by Balas EA, Boren SA. *Managing clinical knowledge for health care improvement. Yearbook of Medical Informatics 2000: Patient-centered Systems. Stuttgart, Germany: Schattauer, 2000: 65–70*

The next large leak in the pipeline is between submission and acceptance. The 46% of studies submitted but not published were attributed largely to sample size, power and design issues. This attrition protects the internal validity of what gets published, but might, like each of the others, bias the external validity of guidelines derived from the systematic reviews of published literature.⁵

Further leakage does not occur between acceptance and publication, and the average time lag is only a half year, similar to that between submission and acceptance. The lag time is even less between publication and indexing in bibliographic databases, but the attrition of studies that actually pass the publication mark is significant at 35%. Balas attributed this loss mainly to inconsistent indexing. One may reasonably hope that with rapidly improving information storage and retrieval technologies, this would be gradually declining.

The next lap of the funnel is a long one, with estimates of lag from 6 to 13 years, and with only half of the bibliographically indexed studies on databases surviving the screen for inclusion in systematic reviews, guidelines and textbooks.⁶ The tendency of systematic reviews, especially in the tradition of evidence-based medicine and the Cochrane Collaboration, to weed out studies that do not meet randomized control trial standards, means that a large body of the potentially useful information for practitioners is lost in final

guidelines. There is also growing appreciation of the merits of including in systematic reviews many of the types of studies and alternative sources of data that previously were considered unworthy of inclusion. A recent examination of the inclusion and exclusion of observational studies along with RCTs in meta-analyses led Shrier *et al.*⁸ to conclude that “including information from observational studies may improve the inference based on only randomized trials,” that the estimate of effect is similar for meta-analyses based on observational studies as for RCTs, that the ‘advantages of including both ... could outweigh the disadvantages ...’ and that ‘observational studies should not be excluded a priori’. When one goes beyond biomedical interventions to behavioural and self-care interventions and to complex programmes involving multiple resources, which must become increasingly more common with the chronic diseases, the studies that would fail to survive this leg of the journey will increase because randomized methods are more likely to face ethical and logistical challenges.⁹

The meta-strategies for improving the flow

In characterizing the presumed diffusion process as a hydraulic pipeline, the analogy suggests that information is lost through a form of leakage; and viewing

the pipeline as a funnel suggests a restricting rather than facilitating of the flow of evidence. The three prevailing strategies for improving the offering of science to practice can also apply a hydraulic or water supply analogy, from the purification of the evidence, to the push of the evidence down the pipeline, to the pull of the evidence by practitioners. The science ‘purification’ remedies in the form of more stringent criteria and rating of research proposals and publications on the rigour of their controls for internal validity have produced a more sterile evidence base from more artificial rather than more practice-based circumstances for the interventions tested. The emphasis on internal validity and the relative neglect of external validity in this process produces a pool of evidence that is further purified by the systematic review process, which tends to weight and synthesize the literature on the strength of evidence, generally equated with internal validity, rather than the weight of evidence across more varied sources of evidence.⁵

The ‘empty vessel’ fallacy of pushing information to the practitioner

The small percentage of original research that makes it to guidelines or textbooks eventually gets practiced, as shown in Figure 2, but not for another 9 years on average. This final phase of the transfer of original research into practice is reflected in Figure 1 at the narrow end of the funnel as a ‘drop in the bucket’ of what might have been of interest to the individual practitioner or of varying interest to different practitioners in different settings. The expectations that accompany its delivery often imply that the practitioner is an empty vessel into which the information can be poured and once full will spill over into action. As suggested by the list of considerations under ‘practice’ at the narrow end of the funnel, the recipient is far from empty with respect to the demands on the practitioner’s time and resources, the expectations of patients and the credence he or she places on the evidence with its inevitable misfit with many of these contextual considerations. The recipient is full of prior knowledge, attitudes, beliefs, values and, above all, contextual constraints at any given point in practice time. Each of these influences the practitioner’s receptivity to new guidelines, their perception of the guideline’s utility and their eventual use of them.

Remedy 1: Participatory research, practice-based

research networks and continuous quality improvement
The most promising lines of remedy have been in bringing the research (or even better, producing the research) closer to the actual circumstances of practice, variously in the form of action research, participatory research and the most fully developed incarnations of these—practice-based research

networks¹¹ and continuous quality improvement or total quality management.¹² The promise inherent in these is that the research results are made more relevant, more actionable, more tailored, more particular to their patients or populations and to their circumstances of practice and with more immediate feedback to the practitioners themselves. The promise of this ‘pull’ approach has led to the suggestion that if we want more evidence-based practice, we need more practice-based evidence.¹³

Remedy 2. Incentives and penalties to create practitioner pull

The practitioner pull strategy seems to have assumed that putting more pressures on practitioners, for example in the form of CME credit requirements for recertification, and offering them more incentives to pursue evidence-based practice guidelines would open up their end of the pipeline. This scenario might also have reasonably assumed that more exposure to the evidence would produce behavioural changes in the direction recommended by the evidence, as well as more demand for further evidence as guideline-driven practices raised new questions. No doubt, this has worked to a degree, but not to the degree expected. What practitioners in clinical, community and policy making roles crave, it appears, is more evidence from practices or populations like their own, more evidence based in real time, real jurisdictions, typical patients, without all the screening and control and with staff like their own. The ideal setting in which to conduct such studies would be their own, which takes us back to the participatory research strategy.

Remedy 3. Getting more attention to external validity in the peer review and editorial policies of journals

One might reasonably conclude that science will always have a gap to bridge to reach practice as long as it is generated in academic circumstances that put such a high premium on scientific control for internal validity that it squeezes out the needed attention to external validity. With support from three federal agencies and the Robert Wood Johnson Foundation, a group of editors of 13 health science journals were convened to explore ways in which they could give greater emphasis to external validity. Although the criteria for funding of research and the peer review process that apply them and perpetuate them might be considered the first line of correction for the over-emphasis on internal validity, we viewed the second pinch in the pipeline to be more amenable to correction, namely the publishing criteria and space devoted to external validity considerations. The editors left with a sensitization to the need to pay more attention, but the practicalities to do so await the leadership of some of those and other journal editors.¹⁴

Making the scientific products more palatable and digestible

The remaining points in the pipeline after (i) funding priorities and (ii) publication criteria, where repairs or corrections could make the flow of science to practice more fluid include (iii) the criteria for inclusion and weighting of studies into systematic reviews and research syntheses; (iv) the derivation and qualification of practice guidelines there from; (v) the academic promotion and tenure criteria and weights given to practice-based research¹⁵; (vi) the research training of graduate students and postdoctoral fellows in methods of practice-based and participatory research¹⁶; and (viii) the training of practitioner students in use of evidence and methods of evaluation that would predispose and enable them to participate more actively in the appropriate adaptation of received evidence and the critical evaluation of their own practices and programmes.

Conclusions

The seventh of the remedies proposed just above speaks to a future in which we would not need to ask the question of how to get more acceptance of evidence-based practice, but one in which we would ask how to sustain the engagement of practitioners, patients and communities in a participatory process of generating practice-based research and programme evaluation. The vision for such continuous practice-based research and evaluation is to adapt the best practices guidelines through 'best processes' of collecting data to diagnose the sociopsychobiological needs of their patients, matching the proposed evidence-based interventions to those needs, filling gaps in the evidence-based interventions with the use of theory and mutual consultation and the prospective testing of complementary interventions. From the preceding critique of the current research production process and pipeline delivery of evidence, we might also conceive of a future in which the cumulative, building-block tradition of evidence-based medicine from highly controlled trials would be complemented by a parallel development and support of a tradition of participatory research and evaluation conducted in practice settings.

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