Published in final edited form as:

Osteoporos Int. 2011 August ; 22(0 3): 445–450. doi:10.1007/s00198-011-1710-2.

Improving Osteoporosis Care through Multi-Modal Interventions: Insights from the University of Alabama (UAB) Center for Education and Research on Therapeutics

Jeffrey R. Curtis, M.D., M.S., M.P.H.

Associate Professor, Division of Clinical Immunology and Rheumatology, University of Alabama at Birmingham

Keywords

osteoporosis; evidence implementation; group randomized trial; bone mineral density testing

Clinical and Translational Research As It Applies to Quality of Care and Evidence Implementation

Despite the many advances in scientific research over the last several decades, cutting edge technologies and therapeutics often take many years to find their way into widespread use. The dissemination and uptake of best practices in clinical care is a separate and sometimes neglected component of research that is essential to improve the population's health. The diagram from the Institute of Medicine (IOM) report in Figure 1 demonstrates the relationships between pre-clinical, clinical, and translational research that covers the spectrum from bench to bedside to the community and into public health policy[1]. Type 2 translational research, sometimes called "Proof in Practice Research," seeks to maximize the yield of what has been learned from the bench and from carefully controlled clinical trials and attempts to extend those benefits to a larger population. One aspect of type 2 translational research, sometimes called evidence implementation or implementation science, applies what has been learned about clinical medicine to achieve best practices across providers and health systems and thereby maximize the health of a population.

Implementation research has been defined as "the scientific study of methods to promote the systematic uptake of clinical research findings and other evidence-based practices into routine practice, and hence to improve the quality (effectiveness, reliability, safety, appropriateness, equity, efficiency) of health care. It includes the study of influences on healthcare professional and organisational behaviour[2]." Healthcare efforts should be directed at implementing strategies that work and allocating limited resources most efficiently. Implementation research is typically considered at the interface between research and quality improvement.

Some may ask whether evidence implementation should be considered research at all. Although potentially still a matter of debate, it seems most prudent to consider any investigation that leads to generalizable knowledge as research and should be governed by an Institutional Review Board or ethics committee.

Using osteoporosis as an example disease state, this article reviews both general and specific aspects of evidence implementation focused on the healthcare provider, health systems, and patients to improve quality of care.

Osteoporosis care generally does not occur during hospital episodes (even for most fracture patients), and strategies to impact multiple points of the healthcare system are vital. Because the main process measures of interest in osteoporosis are usually receipt of bone mineral density testing and osteoporosis medications, it is perhaps most intuitive to first focus on the healthcare provider, usually a physician. However, even this step presents challenges. For example, who is the right provider to target? Using the example of glucocorticoid induced osteoporosis, we might think that the physician who is prescribing glucocorticoids would be the most important provider to engage to make sure that osteoporosis risk has been considered. Moreover, the glucocorticoid prescriber should be the most relevant provider to be aware of the risks of long-term use of glucocorticoid therapy. However, if the glucocorticoid prescriber is a specialist, s/he may consider that osteoporosis screening and management should be the domain of the primary care physician who usually takes responsibility for other health screening. Additionally, if the patient sees a specialist (e.g. endocrinology, rheumatology) who typically is familiar with bone health, then this specialist might be considered the responsible provider. In short, if evidence implementation seeks to intervene with the healthcare provider, even identifying the correct and most appropriate provider for a patient is not a trivial undertaking.

Another challenge is that for many evidence implementation studies, group randomization is most appropriate, not patient-level randomization. The reason for this is that patients are often treated similarly based upon characteristics and/or behaviors of their treating physician or physician group (e.g. a multi-physician group practice, or a health system[3]). Because physicians who practice together may have a greater likelihood to treat their patients similarly, it may make the most sense to randomize groups of physicians. It may also not be feasible to implement an intervention at a patient level rather than at a physician or group level. If one does randomize groups of providers, then there are methodological issues that need to be taken into account in both the design and the analysis phase of a study. A well-defined set of statistical methodologies have been developed for group-randomized trials[4].

Finally, for any multi-faceted intervention, one may want to disentangle the intervention to determine which aspect was effective. However, this is often not feasible. At the design phase, there may be planned subgroups which are too small to allow for definitive conclusions; if determining which component(s) of the intervention were most effective is being considered during the analysis phase of the study, there may be numerous post-hoc analyses which limit inference.

Examples of Physician-Focused Evidence Implementation in Osteoporosis

As examples of evidence implementation in osteoporosis, investigators at the University of Alabama have conducted a number of physician-focused interventions. One example of an intervention in glucocorticoid osteoporosis is described in Figure 2, which provides an overview of the study design.

We identified patients within a commercial health plan that were long term glucocorticoid users and then identified the prescriber who was responsible for the majority of the glucocorticoid prescriptions. Further, we used health plan data to obtain information about Dual energy X-ray absorptiometry (DXA) screening rates as well as utilization of prescription osteoporosis medication such as bisphosphonates.

We randomized the physicians to either an intervention or a control arm. The intervention arm had two components: one of them was a series of Internet-based case based modules made available during the study period. We also audited and provided feedback for each doctor regarding the proportion of their long-term steroid users in the health plan who had any form of BMD testing or prescription osteoporosis medications. We compared these physicians to a metric of the top ten percent of the highest performing physicians who also had similar patients in the health plan. This metric was called the Achievable Benchmark of Care [5]. Following the intervention, we evaluated follow up rates about screening and osteoporosis treatment. The control arm physicians received an unrelated CME module that had nothing to do with osteoporosis.

This intervention did not produce the intended quality improvement and the trial was “negative”. The intervention physicians who received case-based learning and audit and feedback were not more likely to improve osteoporosis screening and treatment. Of interest was a subgroup analysis that found the physicians who completed all three modules (about 1/3 of the total) had approximately 10% better performance compared to control physicians who were similarly engaged. Our research term’s conclusion from this study, and from other studies, is that although the provider may need to be part of an intervention, an exclusively provider-focused intervention is unlikely to yield sufficient improvement in quality of care in osteoporosis.

In light of this evidence and results from other studies[6, 7], we believe that evidence implementation needs to be a three-pronged approach involving not just the physician and healthcare providers, but also must consider the system and patient factors.

Beyond the Healthcare Provider: Improving Quality of Care through Systems Redesign

Pilot testing at UAB

Building on our work focused on providers, we pilot-tested a systems-based intervention targeting women who had never been screened with DXA in the last four years[8,9].

This pilot test of a predominantly systems-focused intervention was conducted within the UAB Health system. UAB is located in downtown Birmingham and it has a number of satellite clinics and dozens of primary care providers. We used billing data to identify all women over the age of 65 that had no DXA in the last four years. We recognized that there is no accepted interval for DXA testing, but it seemed reasonable to assess for a screening test at least every four years. We randomly selected twenty patients per physician and asked the physicians to confirm the medical necessity of the test for each individual. Most patients were considered appropriate for testing by their physicians, although there were a few exceptions given (e.g. patient was on dialysis, had a recent DXA at a community hospital). The osteoporosis clinic staff mailed information to the intervention patients informing them about osteoporosis and gave the patient the opportunity to self schedule their DXA. The main elements of the intervention was to systematically identify the target population in need of screening, and to allow patients to obtain screening without requiring the physician’s and his or her office staff to perform the scheduling.

After testing, the results became available within the UAB Health System as they usually are and the physician is still responsible for reacting to it. Preliminary results from this trial show that allowing patients to self-schedule a DXA yielded improved rates of DXA screening.

Large scale rollout

Building on the UAB pilot project, the systems intervention was further developed in a project funded by the National Institutes of Health (NIH) [10]. Compared to a provider intervention similar to the one initially described, which served as the usual care (control) arm, we evaluated a system-level intervention conducted with Kaiser Permanente that identified all at-risk women and allowed patients to self-schedule a DXA. Patients were provided this opportunity through a mailed brochure that also educated them about osteoporosis and gave them a number to call to directly schedule a DXA without going through their primary care physician (PCP). The primary care clinics (rather than patients, or even physicians) were randomized to avoid contamination and logistic issues relevant for clinics.

Evidence Implementation Focused on the Patient

As the third and final arm of the NIH trial described above, a patient-focused intervention was added to the systems intervention. The idea was to maximally engage the patient to promote better patient-physician communication. The patient intervention involved both mailed materials in the form of a brochure as well as a DVD that incorporated osteoporosis-focused patient narratives.

The purpose was to present information in the form of sound bites to achieve homophily, which is defined as the tendency of individuals to associate and bond with similar others (i.e., love of the same). Rooted in communication theory, there is a recognition that messages delivered by patients similar to the target audience are more likely to change attitudes and behavior. “The power of narratives to change belief has never been doubted and has always been feared [11].”

Narrative Communication: Why tell stories?

Homophily[12] and patient storytelling have been used in marketing and other healthcare efforts. An intervention led by members of the UAB research team led by Tom Houston at a Birmingham county hospital showed better blood pressure control was achieved among patients exposed to patient storytelling given in a cultural sensitive way[13].

As part of creating the patient-focused materials, we adapted the patient storytelling approach to osteoporosis by conducting a number of focus groups; patients described their experiences and impressions regarding bone density testing. For example, one woman told us that she was worried when she got the sample letter in the mail. She previously knew nothing about osteoporosis or bone density testing and was worried that her doctor thought she had bone cancer. This pilot testing and qualitative work was valuable in to try to figure out what other formative elements need to be included in intervention. Ongoing work is evaluating the results of the 3 arm NIH trial, comparing the physician only arm (usual care) to the system-focused intervention to the system + patient intervention.

Harnessing the Power of the Internet to Tell Patients' Stories

To maximize generalizability, we considered a different kind of healthcare setting and partnered with a national pharmacy benefit program (PBM) to improve quality of care for long-term glucocorticoid users[14]. We adopted the same type of story-telling approach and engaged patients at the time that they were refilling steroid prescriptions online. The goal was to engage patients at their teachable moment. The main outcomes of the study were rates of osteoporosis medication use, assessed using the PBM's pharmacy data. The key elements of the intervention were testimonies provided through short video clips available on the internet to patients randomized to receive the intervention. The age distribution of the

patients in these videos was not that of typical women with post-menopausal osteoporosis, which was important since many long term steroid users are younger.

Bringing it all together: Provider, Patient, and Systems Interventions

In a final example, we evaluated home health care as an important setting to interact with post-fracture patients as the key window of opportunity[15]for osteoporosis intervention. Home health care provides services such as physical therapy, medication management or other nursing interventions. Often this is provided post hospitalization for a fracture, and home health care thus may reflect the best ‘teachable moment’ for many fracture patients. In the last project to consider as an example of a multi-modal evidence implementation intervention, we partnered with a large statewide home health agency to improve quality of care to conduct a provider, systems, and patient focused group randomized trial, with randomization at the home health care office.

As part of the intervention, we worked with home care nurses to develop an integrated care plan embedded within the personal digital assistant (PDA) that is used at the point of care to collect data and guide therapeutics (a systems component). The nurses were involved to educate patients about osteoporosis and to assess their fall risk, and also to prompt the physicians to initiate osteoporosis medications if the patient was not already treated. To that was added a further patient-focused intervention where patients were given a structured interview over the telephone to assess their knowledge, attitude, and beliefs regarding osteoporosis, fractures, and osteoporosis care. Patients are then mailed customized, person-specific intervention materials based upon what was learned in their telephone interviews. For example, the pictures and quotes present in the mailed materials reflect individuals of the same race and gender as the patient themselves. Additionally, patients are given their own personalized fracture risk score from FRAX,[16]and then compared that to people of the same age, race and ethnic group. Thus, the materials are tailored to the individual recipient.

Conclusion

Based on the available literature, our published trials, and learnings from ongoing work, key considerations in evidence implementation related to osteoporosis are offered in Table 2. We also conclude the following: evidence implementation interventions for osteoporosis are most likely to be successful if conducted against a background of a supportive healthcare environment and improvements in systems delivery. The growing emphasis on pay for performance must also recognize that it needs to see current performance deficits not as triggers to label physicians as poor performers but rather as a means to identify an opportunity for quality improvement across the entire spectrum of healthcare delivery.

Acknowledgments

Dr. Curtis receives salary support from the NIH (AR053351) and AHRQ (R01 R01HS018517, R13HS020144-01).

References

1. Sung NS, et al. Central challenges facing the national clinical research enterprise. JAMA. 2003; 289(10):1278–1287. [PubMed: 12633190]
2. Eccles MP, et al. An implementation research agenda. Implement Sci. 2009; 4:18. [PubMed: 19351400]
3. Curtis JR, et al. Do physicians within the same practice setting manage osteoporosis patients similarly? Implications for implementation research. Osteoporos Int. 2009

4. Murray, D. Design and Analysis of Group-randomized Trials. New York: Oxford University Press; 1998.
5. Kiefe CI, et al. Improving quality improvement using achievable benchmarks for physician feedback: a randomized controlled trial. *Jama*. 2001; 285(22):2871–2879. [PubMed: 11401608]
6. Fry RB, et al. Racial/ethnic disparities in patient-reported nonsteroidal antiinflammatory drug (NSAID) risk awareness, patient-doctor NSAID risk communication, and NSAID risk behavior. *Arthritis Rheum*. 2007; 57(8):1539–1545. [PubMed: 18050227]
7. Colon-Emeric CS, et al. Randomized trial to improve fracture prevention in nursing home residents. *Am J Med*. 2007; 120(10):886–892. [PubMed: 17904460]
8. Warriner A, et al. DXA Screening and Use of Osteoporosis Medications in Two Large Regional Healthcare Systems. *Arthritis Rheum*. 2010; 62(Suppl 10):S1543.
9. Warriner A, et al. Self-Scheduling of DXA Scans to Improve Osteoporosis Screening in Women. *Arthritis Rheum*. 2010; 62(Suppl 10):S1006.
10. Warriner A, et al. Allowing Patient Self-Referral of DXA Significantly Improves Osteoporosis Screening. *ASBMR*. 2011
11. Green MC, Brock TC. The role of transportation in the persuasiveness of public narratives. *J Pers Soc Psychol*. 2000; 79(5):701–721. [PubMed: 11079236]
12. Kreuter MW, et al. What makes cancer survivor stories work? An empirical study among African American women. *J Cancer Surviv*. 2008; 2(1):33–44. [PubMed: 18648985]
13. Houston TK, et al. Culturally appropriate storytelling to improve blood pressure: a randomized trial. *Ann Intern Med*. 2011; 154(2):77–84. [PubMed: 21242364]
14. Outman RC, et al. Screening and treatment of glucocorticoid-induced osteoporosis in a large U.S. national pharmacy database. *Arthritis & Rheumatism*. 2010; 62:S648.
15. Curtis JR, et al. Osteoporosis in the home health care setting: A window of opportunity? *Arthritis Rheum*. 2006; 55(6):971–975. [PubMed: 17139645]
16. Consensus Development Statement: Who are candidates for the prevention and treatment for osteoporosis? *Osteoporosis Int*. 1997; 7:1–6.
17. Curtis JR, et al. Challenges in improving the quality of osteoporosis care for long-term glucocorticoid users: a prospective randomized trial. *Arch Intern Med*. 2007; 167(6):591–596. [PubMed: 17389291]
18. Slater MD, Rouner D. Entertainment - Education and Elaboration Likelihood: Understanding the Processing of Narrative Persuasion. *Communication Theory*. 2002; 12(2):173–191.

Figure 1. Relationship Between Type 1 (Proof of Concept) and Type II (Proof in Practice) Translational Research across the Spectrum of Clinical Research. Diagram is based on the report written by members of the Clinical Research Roundtable of the Institute of Medicine[1]

Figure 2. Overview of Study Design of Group Randomized Trial of a Multi-modal Intervention to Improve Glucocorticoid Induced Osteoporosis Management among in a Large U.S. Managed Health Plan. [17]

Figure 3.
Operational Aspects to an Intervention to Identify and Offer Women the Opportunity to Undergo DXA Testing [9]

Figure 4.
Overview of Aspects of Narrative Communication that May Result in Changes in Patients' Attitudes and Behaviors[18]

Table 1**Challenges in Evidence Implementation Relevant to Chronic Diseases such as Osteoporosis**

1	Healthcare is not one thing and does not occur in a lab where conditions can be carefully controlled. It has many facets and participants that must be considered.
2	Rarely occurs as a single transaction. For that reason, evidence implementation that engages people repeatedly is often more effective than a one-time intervention.
3	In osteoporosis, most care occurs in the outpatient setting in widely heterogeneous environments. For that reason, it requires consideration of multiple important parameters (e.g. differences in available resources such as personnel, availability of an electronic health record).
4	The generalizability of evidence implementation studies is sometimes limited and may not be transportable to other settings. For example, a closed healthcare environment can typically control all points of interaction between patients and the system. Evidence implementation has been shown to work best in these settings. In contrast, in an open healthcare system where patients are free to choose different providers, fill medications at any pharmacy, and receive services (e.g. bone density testing) in or outside the system is a more challenging environment.
5	Difficulties in sustainability. The extra resources that are needed to develop an effective intervention may continue to be needed at some level to keep the intervention going.

Table 2**Key Considerations in Improving the Quality of Osteoporosis Care**

1	It is important to first define gaps in the quality of care, because it is difficult to improve what one does not measure. These care gaps should be seen as opportunities for improvement and not as a failure of individuals.
2	In osteoporosis, consideration of the most teachable moments is critical. This teachable moment will be different for asymptomatic populations (primary prevention) compared to post-fracture patients (secondary prevention). Creativity and innovation regarding when patients are most amenable to be engaged are key.
3	Interventions only focused on the healthcare provider that require him/her to do better, one patient at a time, is not an effective way to solve gaps in quality of care.
4	Increasing evidence suggests that strategies are required that involve not only providers but also engage patients. A systems-based team approach is likely to be most effective