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Emergency physicians can be leaders in clinical innovation: Tips to JumpStart the engine



Emergency physicians are well suited to develop new technologies that improve patient care. In day-to-day practice in the Emergency Department (ED), clinicians face a broad range of time-sensitive medical conditions that overlap multiple specialties and care settings. Emergency Medicine practitioners have demonstrated an innovative mindsets in the past [1,2]. This must grow. One recent study found that of 40 devices being developed by venture capitalists tested by 400 emergency physicians, only one-quarter were thought to actually assist emergency physicians in their workflow and improve patient care [3]. It is imperative that our specialty systematically accelerates participation in technological innovation in order to develop the tools needed to improve patient care.

A journey of a thousand miles begins with the first step. It can be overwhelming to think of what great invention a physician will embark on. Clinical innovation should follow a needs-based innovation approach [4,5]. This simply refers to starting the innovation practice by focusing on a clinical need and not initially focusing on the solution. This allows the investigator to focus on carefully defining the need, including the population affected by the unmet need, and creates a strong foundation on which to brainstorm potential solutions. Emergency Medicine caring for patients across multiple specialties has resulted in numerous innovative devices from our specialty, ranging from nasal atomizers for intranasal medication to new chest tube placement devices.

The objective of problem-based innovation is to develop a very specific problem statement through an iterative process. The overall structure includes what the intended device will do, in what population, and with what expected outcome. A theoretical example would be a patch to monitor fluid overload in heart failure patients. A problem statement for this would be: “To *noninvasively measure extracellular fluid water content in patients with heart failure* in order to *decrease hospitalizations*.” A very specific problem statement allows the innovators to precisely define the problem to be overcome and start to frame possible solutions.

When you have a clearly identified need and a potential solution, the next step is to develop a prototype. In academics, most universities will have a technology transfer office that can facilitate intellectual property protection for an idea and connections to local resources. One benefit of being part of an academic institution is the ability to develop industry-academic partnerships. Recent articles have highlighted the potential of academic-industry partnerships to accelerate innovation [6–8]. The technology transfer office at each institution can often assist the innovator in deciding the best path to commercialization and can often make introductions to potential partners.

In a non-academic setting, many options exist as well. Having an actual prototype can gain much traction to an idea for an innovator. If one is

fortunate to have their own funds or able to obtain a small amount of funding, many engineering firms can be hired to produce a prototype. While this is a great path to device development, it requires capital to support a professional engineering firm. One way to innovate without significant funding is to cultivate strategic relationships. Our group has formed a collaboration with a local graduate biomedical engineering program. This benefits the program and our team as we provide real world clinical insight to the graduate students and their capstone project is dedicated to our project with a deliverable of a basic prototype at the end of the year. These types of relationships require outside-the-box thinking, but result in the ability to move an idea forward without much, if any, funding.

Despite the potential concerns about conflicts of interests, they are highly prevalent in Emergency Medicine. One recent study surveyed academic emergency medicine faculty about this topic. Of the almost 500 responses, over 80% reported some relationship with industry ranging from receiving food to actively consulting [9]. This has been the focus of recent articles in high impact journals [10,11]. Emergency physicians should always be transparent and guidelines have been developed to help with this [12].

Problem-based innovation is focusing on the clinical problems we face daily. This provides a competitive advantage to our innovation efforts. The next step is to form partnerships that can provide engineering support to obtain a prototype. This allows significant advancement of an idea. If we do not actively lead clinical innovation we are likely to end up with devices and technology that do not truly help us provide the best care possible to our patients.

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Prescription drug assistance for elderly patients in the emergency department



Over the past decade, prescription drug costs have risen rapidly and an increasing number of demographic groups, including many older Americans, are unable to afford their medications. This aging population, especially those with other risk factors, are at risk for medication non-adherence due to the inability to afford prescriptions [1–3]. Prior work has shown that cost-related noncompliance is common among the general population of emergency department users. In one study, 25% of emergency department (ED) patients reported cost-related barriers or concerns related to obtaining medications [4]. Additionally, Blanchard et al. found an association between severe cost-related noncompliance and ED utilization among a population of Medicare beneficiaries [5]. This study aims to identify characteristics of elderly patients in an urban academic ED who are unable to pay for prescription medication and target strategies employed by ED social workers to help patients cope with rising out-of-pocket expenses.

We conducted a retrospective analysis of consecutive patients greater than 64 years old who received medical social work (MSW) consultation in the ED at one urban academically affiliated hospital during a six-year study period. Inclusion criteria were those elderly patients who were evaluated with an MSW consult because of their inability to pay for prescription medications. Demographics, medical history, presenting complaints, treatment, and disposition were obtained from ED records. The main study outcomes were the type of hospital and community resources utilized in the ED to help patients cope with medication costs. One investigator performed a blind critical review of a random sample of 10% of the charts to determine reliability. The inter-rater agreement for this sample of charts was determined using kappa statistics.

During the six-year study period, 3259 consecutive elderly patients received MSW consultation in the ED. Overall, 177 elderly (5.4%) received prescription drug assistance during their ED visit. The mean age was 76.4 ± 8.5 years; the oldest patient was 97 years old. Most patients were Caucasian (80.6%), female (52.6%), and lived with a family member or caregiver (48.5%). Major factors identified that seemed to predispose the elderly to cost-related medication problems included polypharmacy (55.9%), social isolation (36.7%), history of diabetes (29.9%), non-traumatic pain (24.8%) and altered mental status (23.1%). A total of 18 specific barriers to medication adherence were identified through MSW consults (Table 1). These barriers included patient-related factors such as cognitive function, drug-related factors such as availability of generic equivalents, insurance limitations such as gaps in coverage, and various logistical barriers to obtaining medications. During the study period, 29 different hospital and community resources were utilized to help elderly patients with prescription drug costs (Table 2).

Table 1
Specific barriers to medication adherence.

• Poor patient understanding of Medicare/Medicaid plans
• Lack of transportation to pharmacy
• Language barrier
• New Rx not covered by insurance (Lovenox®)
• Need for visiting nurse services
• Terminal illness – needs hospice care
• Poor financial planning
• Problems getting meds from pharmacy
• Cannot afford drug co-pays
• Time gap before insurance will pay for Rx
• Donut hole – Medicare coverage gap
• Pre-authorization needed from PCP
• Poor medication compliance (altered mental status)
• Abuse/caregiver neglect
• Self-neglect
• Emotional distress, depression
• Dementia
• No access to primary medical care

Table 2
MSW strategies used to provide prescription drug assistance.

Caregiver and/or patient education	157 (88.7%)
Medicare and Medicaid counseling	93 (52.5%)
Patient and family care funds at SH	32 (18.1%)
Rx filled at hospital pharmacy	31 (17.5%)
Patient Assistance Programs (PAPs)	30 (16.9%)
Visiting nurse services	22 (12.4%)
Coupon, rebate information	19 (10.7%)
Pharmacy discount programs	18 (10.2%)
Expedited follow-up with PCP	17 (9.6%)
Community medical clinic	16 (9.0%)
Transportation voucher to pharmacy	16 (9.0%)
Change in living situation (ECF, subacute rehab)	13 (7.3%)
Drug samples from PCP	12 (6.8%)
Meds from VA clinic/hospital	11 (6.2%)
Home health services for medication management	10 (5.6%)
Rx changed to drug covered by insurance	9 (5.1%)
Hospice referral	8 (4.5%)
Case management visit to home	8 (4.5%)
Financial counseling for patient and/or caregiver	8 (4.5%)
Pharmacy to deliver meds to home	5 (2.8%)

EDs serve a substantial proportion of patients who are socioeconomically disadvantaged and may not have the resources to pay for prescription medications. In this study, we identified several barriers associated with cost-related medication nonadherence (Table 1). There are a number of programs available for low-income elderly patient populations to help with prescription drug costs. These include federal discounts, state-level prescription drug assistance programs, donated prescription drugs, home health services, public and private subsidies for medication costs, and discounts negotiated at pharmacies to provide affordable medications (Table 2). However, there are limits to these programs, including cost limitations, eligibility restrictions, and lack of provider awareness of these resources [1,3]. We found that dedicated social work and case management services in the ED were invaluable in helping older patients access prescribed medications at lower costs, while simultaneously addressing a myriad of psychosocial risks and other economic concerns. Social workers also can provide services such as telephoning aged patients after discharge, procuring walkers and commodes, arranging transportation, and coordinating referrals to community service agencies. Creative solutions like these are necessary to improve the value and ensure the quality of emergency care delivered to older adults while more fully addressing their complex underlying physical, social, cognitive, and situational needs.