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Abstract

Significant concerns exist over the ability of the healthcare and public health systems to meet the surge demands that would result from an event such as an influenza pandemic. Current guidance for public health planners is largely based on expert opinion and may lack connection to the problems of street-level public health practice. To identify the problems of local planners and prepare a state-level planning template for increasing health care surge capacity that accounted for these issues, a study was conducted of local pandemic planning efforts in thirteen counties, finding that cognitive biases, coordination problems, institutional structures in the healthcare system, and resource shortfalls are significant barriers to preparing and implementing a surge capacity plan. In addition, local planners identify patient demand management through triage and education efforts as a viable means of ensuring adequate capacity, in contrast to guidance proposing an increased supply of care as a primary tool.

KEYWORDS: pandemic influenza, hospital surge capacity, emergency planning, public health preparedness, cognitive biases

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Introduction

Concerns over the threat of bioterrorism, emerging infectious diseases, and the potential for an influenza pandemic are bringing attention to the functional capacity of the healthcare system. The ability of hospitals to manage increased demand for patient care in an epidemic has been questioned. Since the recent emergence of novel avian influenza strains, preparedness for a new pandemic has been an issue of primary concern.(Homeland Security Council 2005)

Annually, influenza results in up to 36,000 deaths in the United States. Influenza viruses experience rapid evolution of primary surface antigens, resulting in periodic pandemics caused by the emergence of novel strains that are more infectious and/or pathogenic than normal. In the best known case, the 1918-1919 Spanish Flu pandemic, it is estimated that over a third of the world population was infected, with an estimated 675,000 deaths in the United States alone.(Taubenberger and Morens 2006) Two milder pandemics and three additional pandemic scares have occurred since.(Kilbourne 2006) The recent emergence of novel avian strains of Type A influenza have raised concerns over the threat of a new pandemic.(Webster et al. 2006) Current CDC estimates place the impact of a new pandemic on the United States as 89,000-207,000 deaths, 314,000-734,000 hospitalizations, up to 47 million illnesses, and an economic effect of as much as $166.5 billion, excluding any secondary effects from economic disruption.(Meltzer, Cox, and Fukuda 1999) Uncertainty exists regarding current capabilities to forecast a pandemic event, meaning that planners operate in the "fog of epidemics."(Krause 2006) The potential impact of a pandemic is large enough that preparation for the threat is a priority.(Benjamin 2004; Palese 2004; Trampuz et al. 2004; Earls and Hearne 2004; Oxford 2005)

Building Surge Capacity

A surge event as one in which the demand for medical services is large enough to require health care facility operations in an environment where resource constraints force the replacement of ideal care standards with care meeting the patient's immediate but not ideal needs. Such surges occur both as transitory "daily surge" events or as a more significant sustained surge.(Bonnett et al. 2007) Daily surge issues are related to economic incentives to keep emergency department staffing levels at a level of maximum efficiency rather than maximum demand, while catastrophic surges arise due to extraordinary events beyond normal maximum demand and involve broader areas of health care than the emergency department.(Kelen and McCarthy 2006)

By the late 1990s, surges during routine flu seasons began to tax the ability of hospitals to provide patient care.(Richards et al. 2000; Derlet, Richards,

and Kravitz 2001) The Community Tracking Study project found in 2006 that the standby capacity of hospitals to deal with emergencies was lacking.(Katz, Saiti, and McKenzie 2006) Likewise, studies of Kentucky hospitals(Higgins et al. 2004) and nationwide(Crosse et al. 2003) found significant gaps in the ability of hospitals to meet the demands of a public health emergency. Capacity shortfalls have been noted in emergency departments, intensive care beds, and general medical/surgical beds.(Bazzoll et al. 2003) Likewise, significant infrastructure issues exist that pose barriers to safe management of patients with highly communicable respiratory infections.(Srinivasan et al. 2004) Workforce shortages, pressures from the payer community, and regulatory burdens aggravate the problem of creating hospital capacity to deal with unusual demands.(Bentley 2001; Kaji, Koenig, and Lewis 2007)

In the United States, the Health Resources and Services Agency (HRSA) established benchmarks for regional surge capacity in terms of the number of patients that would require treatment under various scenarios, but these standards may not reflect the relationship between resources and capacity and were formulated through methods which are not transparent to the scientific community.(Schultz and Koenig 2006) For influenza, current planning scenarios from the US Department of Health and Human Services anticipate that a flu pandemic would involve a minimum of 839,000 additional hospitalizations and an increase of at least 25% in demand for ICU beds and ventilators. Guidance suggests planning for such a surge in hospital demand by examining staffing issues, bed capacity, and the stockpiling of eight weeks of consumable supplies. Planners are urged to plan for care in non-hospital settings such as outpatient clinics and temporary hospital facilities.(Department of Health and Human Services 2005) While identifying the complex and wide-ranging measures necessary to meet surge needs for influenza, neither the plan nor federal budget provides assistance or guidance for how to meet these goals.(Levi, Inglesby, and Working Group on Pandemic Influenza Preparedness 2001) Similar guidance documents for augmentation of care in epidemic events are available from other sources.(Rubeinson et al. 2005; American College of Physicians 2006)

Beyond physical capacity, events such as Hurricane Katrina exposed deficiencies in the ability of both public and private agencies to coordinate planning and responses to disaster situations.(Tierney 2007) When response requires coordination of agencies with differing priorities, planning is crucial in establishing common ground rules and decision criteria.(Allison 1969) Networks with poorly delineated or ambiguously understood communications patterns are likely to fail under the stress of an emergency, making this a critical issue.(Choi and Kim 2007)

One issue increasingly recognized as important is the idea of system resilience, or creating systems able to adapt to unanticipated contingencies.

Despite large funding increases for preparedness activities since 1998, coordination efforts and emergency planning are hampered by conflicting incentives, issue definition problems, and lack of leadership, limiting the ability of the healthcare and public health systems to respond and adapt to large scale emergencies.(Avery 2006) Local and regional coordination gaps are of particular concern in the United States due to a federalistal system and the role of healthcare providers as independent, competing organizations.(Bartlett 2006) Current efforts at emergency preparedness and management coordination, such as the use of the National Incident Management System (NIMS) are hampered by planning mechanisms that dodge tough questions of leadership, collaboration, and authority; excessive and unrealistic efforts to centralize decision making; and failure to involve the entire network in planning.(Lester and Krecji 2007) Recent national surveys have found that emergency planning and coordination between hospitals and other emergency partners is not robust and leaves room for improvement.(Braun et al. 2004; Braun et al. 2006) As an example, the response to a pertussis outbreak in Arkansas in 2001-2002 was hampered by a lack of cooperation between providers and public health personnel.(Wheeler et al. 2004)

To date, most work on pandemic preparedness has focused on a top-down approach, using questionnaires based on expert views to assess needs rather than evaluating preparedness based on needs as viewed from the hospital and local health department/emergency planning level. Generally, this has focused on the presence of certain physical capabilities, without examining the ability of healthcare and public health systems to implement or adapt plans in the event of a need for the capability. For example, the National Center for Health Statistics conducted a preparedness study that focused primarily on items such as the number of beds and ventilators, items identified as useful for a specific emergency – a terrorist attack with biological weapons.(Niska and Burt 2005) An exception is found in "Providing Mass Medical Care With Scarce Resources: A Community Planning Guide," a publication of the Agency for Healthcare Research and Quality (AHRQ) that offers guidance on coordination and planning issues.(Roberts et al. 2006) Our study addresses that gap and complements the work of AHRQ by presenting empirical findings based on lessons learned by local planners as part of the process of preparing local health systems to manage a public health emergency.

Methods

Between November 2006 and August 2007, a team of specialists in public health, nursing, and engineering carried out a project to develop a planning template for surge capacity in the event of an influenza pandemic, with an original focus on establishing alternative sites for the provision of inpatient care. This project was

initiated in response to findings from a 2006 study of Indiana county health departments indicating that significant widespread deficiencies existed in the area of surge capacity development. As a part of this project, a series of structured and unstructured interviews, both via phone and on-site visit, were conducted with representatives of the public health, emergency preparedness, and hospital sectors in eleven Indiana counties representing diverse geographical and demographic backgrounds, and with differing healthcare and public health environments. (Figure 1) The interview questionnaires were pre-tested in two additional counties to identify issues in instrument design.

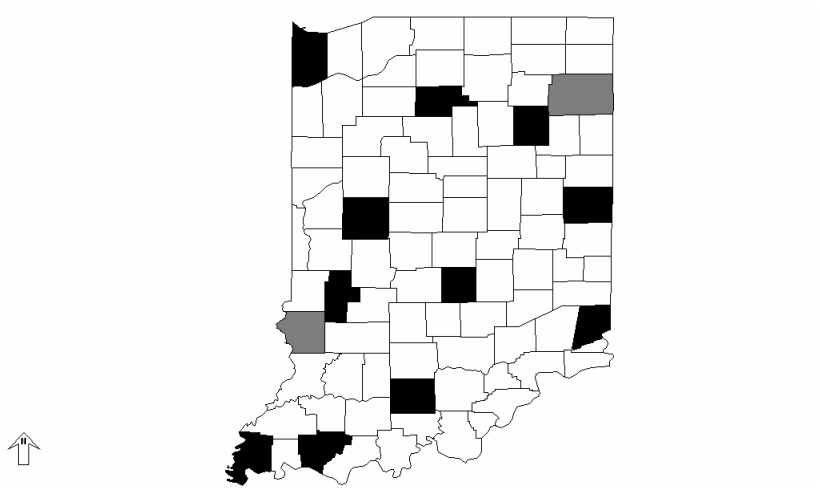

Figure 1. Counties Interviewed Regarding Pandemic Preparedness Planning Efforts

Grey Counties – Instrument validation
Black Counties – Primary Study Group

Multidisciplinary teams including both faculty and graduate students from multiple departments in Engineering, Public Health, and Nursing were assigned to each county, with a graduate student delegated to coordinate efforts and collate collected data. Initial interviews were conducted by a faculty or post-doctoral investigator to train the student teams, and findings were discussed and analyzed in group meetings coordinated by faculty investigators. Reports on the project findings were prepared for each county and shared with the county Health Coordinator, who had the opportunity to provide feedback and clarification. Common themes and significant issues were identified for use in the preparation of the final project report.

Findings

Several basic themes were widely observed. First, the perception of the impact of a pandemic is so strongly shaped by the worst case scenario that it has an adverse impact on planning efforts. Second, planning and coordination problems are widely identified as barriers to preparedness, and are being addressed with mixed results. Third, concerns exist over the ability of local jurisdictions and hospitals to adequately staff healthcare efforts in a pandemic. Fourth, logistical and financial concerns are reported in many counties. Fifth, county planning efforts reveal that counties are attempting to address these problems with surge capacity through efforts aimed at reducing the demand for hospital care rather than increasing the supply of care available. Finally, identified problems indicate that county plans must take into account the fact that an influenza pandemic will not occur in isolation, and the healthcare system will have to continue to deal with other illnesses and injuries as well. These issues are summarized in Table 1.

Impact Perception

In several counties, the perception of the pandemic impact can be characterized as a synthesis of misinformation, resulting in a perception of impact which exceeds the worst cases historically observed. Several counties, for example, cited impact assessments of >50% attack rates and a case fatality rate of 50%. These beliefs were strong enough in some cases to result in rejection by planners of estimates from the CDC software packages FluSurge and FluAid.(FluSurge 2005; Crosby 1999) It was determined that these beliefs were derived from linkage between the case fatality rates of the low attack rate/high case fatality rate of H5N1 influenza strains with the infectivity of the 1918 strains. This is aggravated by federal communication efforts that confuse the two. For example, the federal Department of Health and Human Services created a communications website that is accessed by both the www.pandemicflu.gov and www.avianflu.gov URLs, implying that the two situations are identical.(Department of Health and Human Services) This confusion resulted in a sense of helplessness among some planning teams, resulting from a belief that any planning would be rendered useless by to the magnitude of the problem. This indicates a need for more care in risk communication by federal, state, international, and academic public health experts.

Problem Definition

- Strategic communications from CDC and state agencies overstate the dangers and leads to a perception of helplessness

Planning and Coordination Issues

- Lack of clear role definitions and statutory authority
- Coordination complicated by inter-system hospital rivalries
- Planning boundaries are political and do not match hospital markets
- Focus is largely on planning jurisdiction

Staffing Issues

- Lack of guidance on credentialing medical reserve list members
- Lack of guidance on malpractice insurance/indemnity for medical reserves
- Non-hospital medical personnel are needed for outpatient facilities
- Loss of workforce is anticipated due to illness from the pandemic

Logistics

- Supply shortages are anticipated due to widespread nature of a pandemic
- Planners look to external authorities to alleviate these shortages
- Pressures for cost containment limit the hospital's ability to stockpile
- Costs may force hospitals to reduce operations or close
- Insurance contracts reimburse only for treatment at the hospital's physical address, limiting options for offsite augmentation
- The pandemic is not the only problem- must maintain other critical services such as emergency and chronic disease care

Demand Management

- The best strategy appears to be to reduce demand, not increase supply
  - Focusing on developing triage strategies and augmenting outpatient care
  - Strategic communications plans are critical and need to be implemented across the media market
  - Prepare the public for reduced standards of care and urge prevention

Table 1. Key Findings

Planning and Coordination Issues

Planning and coordination efforts are hampered by two issues. First, there is a lack of clarification of the roles of local public health, emergency management, and healthcare officials. In some jurisdictions, this is further hampered by lack of support from one or more of these parties. Second, planning jurisdictions are

delineated by political boundaries which bear little resemblance to the geography of local health care markets, resulting in a mismatch between the way resources are used and the plans formulated for using them to meet the demands of a pandemic.

Role clarification difficulties appear to be driven primarily by local factors, aggravated by a lack of clear role definitions and statutory authority. The state Pandemic Influenza Plan (Monroe 2006) is vague on the roles and responsibilities of local health departments, which may be complicated by confusion with role delineation in other state and local emergency plans. County Emergency Management Agencies (EMAs) are generally delegated responsibility for local emergency management, while local health departments have responsibility for public health issues, and hospitals remain independent organizational actors, meaning that any coordination is dependent on the ability of local sector leaders to cooperate with each other and define roles on a local level. Where the environment is organizationally complex, coordination problems grow. One large urban county, for example, reports that the existence of multiple public health jurisdictions, multiple hospital systems, and nearly two dozen emergency medical service providers renders coordination between planning partners difficult, even with cooperative relationships.

Rivalry between hospital systems was observed to have an adverse impact on coordination, although the study found that a mediator could reduce the barrier. One county reported difficulties in logistical cooperation due to hospitals operating to protect themselves by withholding inventory. Another mid-size county experienced issues arising from aggressive competition between two rival hospital systems. Fortunately, the presence of an outside third-party (the project team) served as a moderating influence in bringing the systems to the table and initiating discussions that concentrated on “big picture” planning for a pandemic event, which led to the formation of an interagency “Pan Flu Core Planning Group” including key members of the healthcare and public health communities for continuing coordination. The Emergency Preparedness Coordinator in a third county noted that, although they experienced no significant conflicts, meetings attended by the study group resulted in more productive discussion and greater willingness by participants to cooperate and execute ideas. This unanticipated side effect of the study provides evidence that the utilization of impartial parties to facilitate discussion can have a positive impact on coordination efforts.

Problems also exist in less complex environments. One small county reports that, although the local EMA theoretically would take charge of managing a pandemic emergency, in practice the hospitals retain control and hence the feasibility of implementing the plan may be questionable. Resource constraints further hinder efforts in smaller counties. One small county reports that planning efforts are hindered by the absence of a permanent, full-time county emergency

management director coupled with lack of leadership from the local health officer. While county elected officials desire to be informed of plans, they do not actively participate in the planning process. The county leadership was described as taking "we'll worry about it if it comes" view of their role. Some small counties lack not only public health leadership resources, but also have no hospital and no physicians to step in and assume an emergency leadership role. Because of resource scarcity, public health and emergency planners in some of these counties believe that they would not be required to respond, and could thus defer responsibilities to neighboring counties.

Many planners exhibited unrealistically high expectations for external assistance, particularly in terms of material support from state organizations such as the National Guard and the Governor's Office. County perceptions appear to be grounded in experience with localized disasters such as floods or tornados, experiences that are qualitatively different from a delocalized emergency such as a pandemic.

Figure 2. Differences Between Indiana County (Left) and Hospital Market Boundaries (Right).
Market Boundaries represent Health Service Areas from the Dartmouth Atlas of Health Care.

Even if intracounty coordination issues were resolved, a problem remains in that hospital market boundaries do not coincide with political boundaries (state, state emergency planning district, or county) used for planning (Figure 2). Epidemic disease and similar hazards are noted for the property of spatial indeterminancy – occurring not "in a place, but in multiple places simultaneously, so that their spatial dimensions are often difficult to identify." (Aguirre et al. 2005) This complicates the problem of developing institutional resilience when emergency planning is focused on local issues and a point source perspective. Much of the Homeland Security and FEMA training material used by the counties focuses on single-point emergencies, thus bringing limited attention to the additional logistical challenges of multi-site responses that extend over a broad

spatial area and extended duration.(Levin, Gebbie, and Qureshi 2007; Davey 2007; Gensheimer 2004) Preparedness resources distributed for bioterrorism planning, for example, have been criticized for undercutting broad, inter-jurisdictional all-hazards planning.(Smithson and Levy 2000)

Clear evidence of the special indeterminancy aspect of pandemic response coordination was observed in the problems faced by the study population. Three study counties, as well as one of the two validation counties, are at the core of health referral regions that cross into three states, and two other counties (a mid-size suburban county and a small rural county) are part of referral regions with significant service providers in other states. All cited significant issues with planning and resource allocation. One of these noted, for example, that the other state was willing to coordinate how to transfer patients to Indiana hospitals, but was unwilling to provide resources to help support care for such patients.

Similar issues were seen with cross-county coordination. In nearly every case, local government planners were focused on the population of their counties, with the assumption that resources in that county would be utilized only by that population. In two cases a broader horizon was voiced, yet concrete action to coordinate planning across a market had yet to be undertaken. One large county simply worked from the assumption that they would be responsible for taking in out-of-county patients, yet had not taken steps to coordinate with surrounding jurisdictions. Another local health officer reported a rebuff of attempts to coordinate planning with other jurisdictions. Planners in smaller, outlying counties within secondary markets also failed to report efforts to initiate cooperation with counties at the core of the referral regions.

While this problem was widespread among government planners, some interjurisdictional planning was reported within hospital systems with larger system hospitals supporting smaller outlying hospitals within the same health system. One system, for example, reported the ability to augment the staff resources at small community hospitals through a telemedicine system.

Although coordination and cooperation are vital for robust planning, one disturbing trend was an underestimation of the requirements to implement a plan. In many cases, it was felt that simply identifying partners for a response was enough to ensure that the problem could be managed, an attitude that results in a lack of effort to identify potential problems and address them in advance of an emergency.

All major partners expected to participate in a disaster response scenario as complex as a pandemic event should be involved in the initial planning phases for at least two major reasons. First, role expectations for all parties will be identified and modified if the expectations cannot be met. Second, effective coordination is often dependent on the development of relationships over time, a process that is difficult to accomplish during the execution of a disaster response.

Through initial involvement of more partners initially, gaps in expertise and function will be identified earlier, allowing time for adapting plans.(Gerber 2007; Glass 2001) The implementation of jointly developed plans will thus be smoother than if created in isolation because of the ability to develop and identify procedures for interfacing between organizations.

Staffing Problems

Nearly every county planning group identified issues with staffing as a significant problem. All interviewees worked from a common assumption that at minimum the same percentage of healthcare workers as the general population would be affected by the disease at a time when demand for care was increasing. Broad efforts were cited to implement guidance from the federal Pandemic Influenza Plan (Department of Health and Human Services 2005), but significant problems with the guidance suggestions were noted.

Most counties had undertaken efforts to establish a "reserve" list of retired or inactive physicians and nurses, but cited a lack of state guidance on licensing and credentialing issues, and few had addressed the issue of malpractice insurance and indemnification. These issues were felt to be beyond the jurisdiction of the county-level planners. In addition, a widely cited theme was a lack of confidence that those on a "reserve" list would in fact be available in the event of a pandemic.

A number of counties have looked at the use of non-hospital medical providers. One barrier to this is the realization that staff in facilities such as outpatient clinics may be more useful by reducing the demand for hospital services by providing care in an outpatient setting. Several counties were exploring arrangements to have outpatient practices pool resources and consolidate practice locations to more efficiently use outpatient care resources.

Several counties with nursing schools operating within their borders have explored the idea of utilizing nursing students as care extenders, but the efficacy of this will depend in part on school decisions on how to respond to a pandemic event and whether to continue operations. In addition, while nursing schools have been approached, the study did not reveal whether any county has explored the willingness of students to agree to assist. One county has explored the idea of an out-of-hospital inpatient facility to provide minimal care using EMS personnel with periodic visits by a nurse or physician.

The concerns voiced by the interviewed planners are not unique to Indiana, and have been noted elsewhere.(Wynia and Gostin 2004) Plans effectiveness should not depend on brittle assumptions regarding the availability or willingness of providers to respond to an emergency. As a result, realistic plans account for a reduction in the available healthcare workforce.

Logistical and Financial Barriers

The fourth significant problem area identified by the study counties concerned the ability to manage the logistical issues associated with a surge in demand due to the pandemic, as well as managing the costs associated with the surge. Because a pandemic by definition involves a broad section of the population in a widespread geographical area, most planners assume that a relatively large percentage of the population will be infected, with resulting disruptions of supporting services, and that all similar jurisdictions will be likewise impacted, meaning that external assistance would be limited. As a result, the planners voiced the assumption that they will be operating in isolation and competing for scarce resources. This is probably an appropriate assumption, in contrast to planning for other public health emergencies, such as a bioterrorist attack or natural disaster such as Hurricane Katrina, where external help is likely to be available in the form of federal assistance or resource transfers from unaffected regions. At the same time, the planners continued to act in contradiction to this assumption by looking largely to external agencies such as the National Guard or the Governor's office to solve the problem of resource shortages.

The most significant problem area discussed concerned the possibility of replenishment of medical supplies. Nearly every county involved in the study cited this as a significant worry. Pharmaceuticals and personal protective equipment topped the list, although more prosaic issues such as food and laundry services were cited in a number of small counties. Pharmaceutical worries extended not simply to flu/pneumonia specific drugs such as antivirals or vaccines, but also to maintenance medications for chronic diseases. Two counties cited plans to have patients to bring their own maintenance medications if admitted to the hospital in order to ensure that their needs are met. At least one county was concerned that supplies of these medications would be reduced to the point where hospital demand would be increased as a result of lack of medications to manage chronic conditions. One factor cited as complicating the ability of hospitals to develop stockpiles for emergencies are economic pressures to run lean operations, which has led to adoption of a version of just in time ordering interpreted as minimizing inventory rather than managing the costs of inventory. On the other end of the pipeline, planners in one large county cited concerns over how to dispose of higher volumes of medical waste when the availability of waste disposal is uncertain during pandemic waves.

Smaller counties are particularly constrained by a lack of bed space and equipment. One county lacked a hospital or even a physician practicing within the county. Those with critical access hospitals lack bed space and often other important resources, such as ventilators, respiratory isolation, or ICU beds. An example of this situation is seen in a county of approximately 27,000 that has

access to no ICU beds and only two ventilators, a level of resource availability barely adequate under the best case scenario modeled using the CDC FluSurge and FluAid tools. Furthermore, this county currently lacks the nursing staff to continuously support even one patient on a ventilator. Although some have attempted to develop infection control plans that separate flu patients from the general population, this is problematic in small hospitals that lack the physical space to obtain adequate separation. Space limitations are complicated by the competing demand to add bed space to meet increased demand. At the other end of the spectrum, a large metropolitan county with multiple multi-hospital systems and significant resources is developing a plan to dedicate an entire hospital to influenza patients.

A commonly identified issue concerns the financial implications of a pandemic. One hospital noted that, under their estimates of increased demand, they would be forced to cease operations within 30-40 days. Others indicated that they would be dependent on federal or state disaster assistance funds for operational expenses, an assumption that may be unrealistic for an event that would involve much of the country. Few considered the fact that most patients would be insured and that they could use usual mechanisms to seek reimbursement for care which might provide a revenue stream. One small county hospital that did look at insurance reimbursement found that insurance reimbursement would only be made if care was provided at the hospital's physical address. This logistical/legal specification limited options for expanding bed capacity based on *ad hoc* county needs. Others made the assumption that a widespread event would result in default by insurers due to bankruptcy from a large number of claims.

Managing Demand

Given the perceived barriers to increasing hospital capacity, most planners have opted to deal with hospital capacity issues at least in part through efforts to reduce demand for hospitalization. These efforts generally take the form of triage systems during the active pandemic period to ensure that hospital resources are utilized only by patients with the greatest medical need. Additional tools have been identified for development prior to the pandemic outbreak to reduce the intensity of the event, including public information efforts to convince those with the disease to utilize self-care when possible, creation of dedicated outpatient flu and fever clinics, and public education programs to prevent exposure by encouraging social distancing.

Triage, by definition, focuses on identifying those cases that are most urgently in need of treatment and most likely to benefit. As healthcare resources become strained, providers are increasingly pressed to make decision regarding

the allocation of those resources. Developing a triage plan in advance overcomes a number of issues that may arise, providing a set of *a priori* criteria and procedures, reducing confusion and the need to force already pressed providers to make what may appear to be arbitrary decisions. One recent study, based on hospital capacity in northern Netherlands, suggests that the use of triage strategies based on strong indications and firm decision-rules can allow hospitals to maintain the capacity to serve most patients requiring intensive care.(Nap et al. 2007) One positive sign observed in this study is that most counties have included this issue in discussions of how to respond to a pandemic event. One particular concern is separation of potentially infectious flu patients from uninfected patients with other health problems. As a result, plans were being discussed to segregate flu patients or move triage functions out of the hospital physical into facilities such as a tent clinic or neighboring school gym to control the risk of infection. Larger counties with multiple hospitals have adopted a variety of triage strategies, including centralized facilities and triage operated at each individual hospital by that hospital.

Some counties have taken the first steps towards more sophisticated triage criteria by the development of a strategy to ensure that adequate outpatient care is available for less serious patients. Besides ensuring that outpatient care remains available, these strategies reduce the pressure for patients to seek hospital care. Specific strategies vary. One larger county at the center of a regional market worked with the multisite, multispecialty group practice employing the majority of local physicians to develop a plan for converting one of five clinic sites to a dedicated flu clinic. At the same time, the group plans to dedicate a second site to treatment for chronic disease patients at high risk for infection– chemotherapy, renal dialysis, etc – in order to reduce the probability of infection through exposure to the general patient population. Another small county was working on arranging for primary care practitioners to pool resources for dedicated clinics. A mid size county was developing plans to supplement outpatient providers with EMS personnel as extenders at off-site centers which would combine the triage function with a fever clinic.

The key component to these strategies is a strong public education and communication plan. The key stakeholders in the event of a pandemic include not just planners or healthcare providers, but also the general public - the pool of potential patients in the event that a preparedness plan must be implemented. Almost every county had at least a basic communications plan in place to provide the public with information on the disease, educate the public as to how the local system was responding, and to explain emergency care procedures to manage public expectations and direct patients to the most appropriate source of care. A specific concern that was raised, however, was how to fund a media strategy.

Another potential problem identified was the discontinuity between service areas and planning geography – in this case, the structure of media markets. Many county planners focused only on media sources physically located in the county, rather than the sources actually used by their population. For example, one suburban county planned on disseminating information through the one radio station located in the county borders, a college radio station with a weak signal and limited transmission range, rather than the higher rated television and radio stations in the adjacent urban county. Where this issue was considered, concern was raised over the potential confusion arising from the same media presenting potentially conflicting messages from multiple counties.

Consistency of message was emphasized by one large urban county which had recently experienced a strain of influenza which forced all local hospitals to diversion status. Within that county, efforts had been made to use that experience to develop a coordinated message. Likewise, another mid-sized county has focused on developing a common communications strategy for participants. Coordination between counties was, however, largely non-existent. As an example, one larger county had developed printed educational material and expressed a willingness to share it, but neither it nor its neighbors had initiated contact to make that a reality.

Not all efforts focused on mass media. Many had initiated outreach efforts in the form of community speaking engagements by local government and hospital staff. Most planners were aware of special populations that might pose unusual problems in terms of communications, such as Old Order Amish communities that had little contact with electronic media or refugee/immigrant populations with language or cultural barriers. County governments, hospitals, and in some cases cooperative local businesses or educational institutions had begun efforts to prepare their workforce for issues relating to a pandemic via strategies such as educational flyers included with pay stubs. One county stood out by developing an educational DVD that contained messages from other jurisdictions, which was distributed both in and out of the originating county.

In addition to preparing the population for altered standards of care and procedures for accessing care, counties we visited were concerned with using the educational efforts to try to prevent the spread of the disease, with the view that reducing infection rates would reduce the surge in demand for care. As a result, most included efforts to convince the population to practice some form of voluntary social distancing. In at least one county, with essentially no health care resources and weak public health leadership, the adoption of this strategy amounted to a symbolic effort resulting from a perception that they lacked the resources to develop a plan to deal with other issues related to a pandemic, yet needed to do something. Conversely, one mid-size county had given the problem sufficient attention as to identify the need to maintain in-home entertainment (for

example, television programming) as a key factor in encouraging voluntary distancing.

The majority of counties considered an involuntary quarantine strategy unworkable, due to lack of resources to enforce quarantine orders, limited involvement by political and law enforcement leaders, and sometimes weak leadership from emergency management and public health agencies. In general, county-level planners seemed to overestimate public compliance with social distancing measures, and to underestimate the difficulties of implementing quarantine. Some counties indicated a belief that the only necessary steps to assure universal effectiveness during an involuntary quarantine would be a request that individuals stay home.

Pandemics Do Not Occur in Isolation

A consistent message that was communicated to the research team was that emergency planning cannot assume that the pandemic emergency is the only demand on health care organizations. Essentially every county noted that the demand for other health care services would continue, and not all of these demands were for elective services that could be deferred. Hospitals were planning under the assumption that they would have to provide care for other pressing demands, such as trauma, medical emergencies, childbirth, and chronic illnesses. As one hospital planner noted, "people will still have heart attacks." In addition, several county planners noted the possibility of a second, overlapping incident such as a blizzard or tornado required building additional resilience into pandemic plans. The existence of these needs means that not all beds can be allocated for flu, and thus planning requires attention to infection control to prevent transmission to other seriously ill and hospitalized non-influenza patients. Resources such as ventilators will require allocation between influenza and other medical and surgical patients. Although some larger counties with multiple hospital systems were able to consider dedicating hospitals to flu patients, the majority did not have that luxury due to the presence of a single hospital. Staffing augmentation efforts likewise need to account for this. It was noted in several cases that the use of EMS personnel as care extenders was limited by the need to maintain emergency response capabilities, which were already stretched to the point that a significant percentage of EMS responders worked multiple positions in the field. Likewise, the use of outpatient nursing and physician personnel was limited by a realization that reducing the availability of outpatient care was likely to drive more patients to seek hospital care. Almost all counties were giving consideration to altered standards of care to stretch resources, but were wary of this option due to liability concerns and lack of statutory protection from

malpractice claims, a concern heightened by lack of guidance from state and federal governments.

Discussion

The problems identified in this study, unfortunately, are typical of emergency preparedness planning. At the local level, disaster preparedness and planning is often hindered by local political and practical barriers, (Gerber 2007) and responses are conditioned by rumors, trust, existing social relationships, and turf issues.(Glass 2001) As Meyer argues, three cognitive biases have been widely found to weaken planning efforts for low probability/high consequence risks: an over reliance on short-term feedback, tendencies to extrapolate directly from the present to the future, and excessive discounting of future rewards compared to short-term costs.(Meyer 2006) All of these were observed in this study.

Organizational learning was distorted by a misinterpretation of the risks arising from a pandemic situation as well as an over reliance on lessons from planning for bioterrorist and other point source incidents. Multiple messages regarding the H5N1 avian influenza strain, the history of the 1918 pandemic, and the use of the rhetoric of the worst case scenario resulted in many planners confusing the messages and assuming that any future pandemic would have consequences worse than any influenza epidemic recorded. Because some hospitals can manage the surge from a mild pandemic without extraordinary measures (Sobieraj et al. 2007), this perceptual bias hinders realistic and effective planning. Efforts by state and federal agencies to develop local response mechanisms to respond to emergencies resulted in institutional planning mechanisms that are focused on political boundaries and mechanisms that are divorced from the reality of the service areas of the actual primary responders – healthcare delivery organizations. Guidance from state and federal agencies, which form the basis of most response planning, largely treats response elements as discrete response elements, which resulted in barriers to recognizing the interconnection of efforts.

Extrapolation of the present to the future was observed as well. For example, plans to use nursing students in several counties as care extenders assumed that nursing schools would continue operations, or that students would remain local and willing to participate in the response in a high risk environment. With few exceptions, planners failed to look beyond their borders, whether to identify resources to support their population or to identify additional demand for resources in their jurisdiction. Because planning responsibilities are defined by local political jurisdictions, most focused only on those jurisdictions, with efforts to initiate intercounty cooperation rarely noted. Although some changed premises were recognized, such as the need for altered standards of care, it was largely

assumed that the ramifications of these changes were beyond the scope of the local agencies, and would be dealt with by state authorities. Several counties made the assumption that state aid, from the state Department of Homeland Security or the National Guard, would be available at the same levels for a widespread pandemic, based on their experience that such aid was forthcoming for a localized problem. This assumption persisted despite guidance that such assistance was unlikely.

The discounting issue was most evident in the areas of logistics. Once the assumption was made that the system would face a large increase in demand for care, the cost of providing care at the level of current standards dominated discussions of the hospital level response. Repeatedly, the cost of pharmaceuticals, supplies, and staffing were cited as barriers. At the same time, assumptions of how to cover the costs were notable in the failure to realize that many costs may be recovered through normal insurance billing processes and reductions in elective procedures and the use of triage mechanisms to reduce demand from less severe cases could result in reductions in extra demand for materials. How well the insurance system would cope was beyond the scope of this study, however, responses indicated that planners had not explored the issue. Although mechanisms for demand management such as communications strategies, use of outpatient care for less serious cases, and triage to assist in allocating care were widely included in plans, the impact of these on resource needs was not recognized in a corresponding manner. Much of the discounting problem may be attributable as well to the effect of short term feedback. Bed capacity at many hospitals is tight because of growth strategies adopted in response to cost containment pressures, which has also led to efforts to control inventory and staffing.(Bellandi and Rauber 1999) This environment provides a perceptual filter that shapes a growth in utilization as a reduction in profitability.

These results support findings from other studies. Problems with preparedness planning and implementation are not unique to Indiana, as the well-known problems at the local, state, and federal levels in Louisiana during the Hurricane Katarina catastrophe revealed. Higgins and colleagues, using the Mass Casualty Disaster Plan checklist, found in 2002 that hospital preparedness in Kentucky was clearly undeveloped and in the early stage of planning, with planning more developed in those counties participating in the Metropolitan Medical Response System (MMRS) program.(Higgins et al. 2004) This reflects the situation we observed. While planners, for the most part, were committing a significant effort in trying to develop a pandemic influenza plan, and in fact had made large strides over the previous year, the plans developed were still crude and required much more work. The few study counties that were participants in the MMRS program, as in Kentucky, had more experience in disaster planning, more resources to commit to preparedness efforts, and were further along in their

efforts. Likewise, the problems of coordination, oversight, and shared procedures, while disturbing, are no different than those experienced in Ontario during the 2002 SARS epidemic(Cameron, Schull, and Cooke 2006), Arkansas in applying bioterrorism preparedness protocols to a recent pertussis outbreak(Wheeler et al. 2004), or those reported in other studies of emergency preparedness, where similar trends in improved planning are also seen.(Braun et al. 2006; Braun et al. 2004) This study found smaller, more rural areas less prepared and less capable of responding to a pandemic, likewise similar to other findings.(Manley et al. 2006)

This project began with the goal of developing a planning template for the use of alternate, non-hospital care sites to expand hospital surge capacity. Lam and colleagues, examining pandemic response strategies from all 50 of the United States as well as several foreign governments, found that the idea of the alternative care site was widespread, but rarely articulated how these sites would play a role in the community response or whether they would even be feasible.(Lam et al. 2006) From in-depth interviews with community emergency planners, our team derives similar conclusions. Significant barriers exist to the use of alternative care sites for building hospital surge capacity, and any attempt to develop such capacity should focus on how alternative care arrangements fit into the overall local emergency management and healthcare systems. More important than an alternative care *site* is the strategy for an alternative care *system*.

These findings suggest several lessons for improving the ability of the public health and healthcare systems to build emergency response capacity, all of which arose during the interviews with the county planners. The first is that building surge capacity requires coordination between public health, emergency management, and health care professionals at a local level and in recognition of local factors. A corollary to this point is that the definition of "local" may not correspond to the political definitions as understood at state and federal levels. In the case of building surge capacity, health care service areas do not conveniently match local political jurisdictions, meaning that effective "local" planning might be better done at a regional level. In addition, mutual aid, which is built into the planning assumptions connected with location-limited, geographically-focused public health emergencies, isn't as relevant to pandemic flu planning, which by definition involves a large, widespread impact. As a result, planning efforts run into coordination barriers resulting from a cognitive mismatch between planning jurisdictions and implementation networks.

The second lesson is that all-hazards preparedness may require different plans to build surge capacity for different scenarios. Acute, localized events pose different requirements for surge capacity and different resource constraints than extended or widespread problems. As Foreman notes, "The more durable a threat is, the more likely it is to acquire policy complications."(Foreman 1994) External assistance (such as deployment of the Federal Medical Station hospital

augmentation units) may be available during a localized event, but not during a pandemic. A mass shooting incident such as took place at Virginia Tech, on the other hand, may present fewer but more complex cases requiring immediate intensive treatment, where an influenza pandemic would require less intensive supportive care for more patients over a longer time period. Each presents different challenges, and requires different solutions. A one-size-fits-all plan will not reflect these constraints.

A third lesson is that legal and institutional barriers may constrain planning in ways not immediately evident, and that planners may not have the authority or power to address these problems. Issues such as insurance reimbursement, malpractice and liability insurance, and scope of practice rules constrain the potential solution set for local planners, and require policy action at a state or federal level to solve. Likewise, legal and logistical issues related to enforced isolation are complex and may be outside the scope of authority of local planners. As a result, higher level planners (state and federal) need to develop mechanisms to gather information from planners regarding potential barriers and build a policy-making capacity to address these barriers before a disaster occurs.

A final lesson is that planners need to more explicitly and actively challenge their assumptions about emergency response capabilities and conditions, because the characteristics of some emergencies force planners and responders to perform tasks far outside of their traditional cognitive framework. That framework is reinforced because it reflects the normal environment the planners experience and is rewarded under normal conditions. Emergencies, however, are not normal events, and successful strategies under ordinary conditions are unlikely to be appropriate for managing under extraordinary circumstances. Reconciling the two is perhaps the biggest challenge for emergency preparedness efforts.

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