



An Introductory Analysis of Potentially Preventable Health Care Events in Minnesota

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MNAPCD
All-payer Claims Database

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As required by Minnesota Statutes, Section 3.197, the cost associated with the preparation of this report was about \$65,621.

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EXECUTIVE SUMMARY



An Introductory Analysis of Potentially Preventable Health Care Events in Minnesota

Minnesota's health care system, when compared to the U.S. overall, is viewed as one of the most efficient and cost-effective. Yet the need to identify and implement new ways to realize additional efficiencies and savings, without compromising quality of care or patient experience, is an ongoing challenge. Health care spending still accounts for a sizable share of the state's economy. In 2012, 13.5 percent of the economy, or a total of \$39.8 billion, was spent on health care in Minnesota. Health care spending in Minnesota is expected to nearly double between 2012 and 2022. This report explores one set of opportunities for health care system improvement and potential savings by analyzing Emergency Department (ED) visits, hospital admissions, and hospital readmissions to uncover the volume and make-up of potentially preventable health care events.

What is a Potentially Preventable Event?

To be identified as potentially preventable for this report, an event had to fit a set of criteria drawn from clinical practice, empirical investigation, and the literature that suggests the event could have been prevented with the right circumstances, such as:

- Timely access to high quality care in outpatient settings;
- Improved medication management;
- Greater health and health system literacy; and
- Better coordination of care among providers across the system of care delivery and between patients, their families and health care providers.

Not all of the identified events are likely clinically preventable at an individual level, although many may represent missed opportunities for prevention. Even for those that are preventable, the best opportunity for prevention may exist further upstream than the point of care, or even lie outside of the health care delivery system altogether and require improved community-based, public health interventions. For example, asthma hospitalizations for children who live in rental housing can be triggered by the presence of carpets that landlords are unwilling to remove.

The Minnesota Department of Health (MDH) analyzed health care transaction data for approximately 4.3 million insured Minnesotans, using information from the Minnesota All Payers Claims Database (MN APCD). The MN APCD includes data from both public and private insurance payers. Minnesota is one of only a small number of states to collect health insurance data on such a comprehensive scale, and this report represents the first time a state's APCD was used to systematically assess the volume and impact of potentially preventable health care events. This high-level analysis was conducted using data for dates of service between 2010 and 2012; results are reported within broad categories of insurance coverage – Medicare,

Medicaid (including MinnesotaCare), and Commercial Insurance. For this report, MDH used analytic tools developed by Minnesota's 3M Health Information Systems.

Because the MN APCD captures nearly all health care transactions for Minnesotans, it is well-representative of the state overall, and uniquely suited to drawing inferences about health care use in Minnesota. And because the MN APCD includes data from across the spectrum of care delivery, it provides a significant advantage for the analysis of potentially preventable health care events. This report is intended to serve as a baseline analysis that lays the groundwork for a more in-depth conversation about how to make Minnesota's health care system more effective and efficient in providing quality care for all Minnesotans.

Key Findings

In 2012, Minnesotans experienced an estimated 1.3 million potentially preventable health care events, accounting for approximately \$1.9 billion in cost, or about 4.8 percent of total health care spending in the state that year. *This volume of spending does not, however, represent real potential savings because not all identified events were actually clinically preventable – on average, cases might be preventable, but individual patient circumstances might make care necessary. In addition, preventing such events may require new investments elsewhere in the system.*

Volume & Cost Associated with Potentially Preventable Health Care Events in Minnesota, 2012

Emergency Department Visits



1.2 Million Visits
Cost: \$1.3 Billion

Hospital Admissions



50,000 Hospital Stays
Cost: \$373 Million

Hospital Re-Admissions



22,000 Hospital Stays
Cost: \$237 Million

Factors that Can Help Prevent Use of These Services

- Timely access to high-quality care in outpatient settings
- Improved discharge planning & medication management
- Greater health and health system literacy
- Better coordination of care among providers and between patients, families and providers

A large share of emergency department visits – about two out of every three visits – were potentially preventable in 2012. Many patients were seen more than once for a condition that was potentially preventable. For example, as many as 50,000 Minnesotans had four or more potentially preventable ED visits in a calendar year.

Patients on Minnesota public health care programs, who in 2012 made up nearly 14 percent of the population, accounted for 40 percent of potentially preventable health care events. As with other payers, ED visits were responsible for most of these preventable events (97.2 percent).

While many patients who experience potentially preventable events have complex health care needs, this is not the case for all patients. Just over half of patients who had a potentially preventable ED visit and nearly 40 percent who had a potentially preventable admission had otherwise low health care use.

There is variation in the conditions that are responsible for potentially preventable health care events. For potentially preventable ED visits, infections of the upper respiratory tract (9 percent), abdominal pain (7 percent), and musculoskeletal system and connective tissue diagnoses such as back pain (7 percent) were the most prevalent diagnoses. The top three conditions for potentially preventable admissions included: pneumonia, excluding pneumonia related to bronchiolitis and respiratory syncytial virus (13 percent), heart failure (12.1 percent), and COPD (8.1 percent).

For readmissions, the three most frequent conditions account for approximately 15.2 percent of all readmissions and include: heart failure (6.6 percent), blood infection (septicemia) and disseminated infection (5.1 percent), and major depressive disorder and other unspecified psychoses (3.5 percent).

Conclusion

Discussions of inefficiencies in the health care delivery system often focus on eliminating unnecessary services (tests, imaging, C-sections, etc.). In many ways this introductory analysis complements that work by identifying potentially preventable events that occur in high cost settings. But it also offers a new perspective on potential improvements in how care is delivered, by highlighting the characteristics of patients who experience care that may not be as well-coordinated as it could be. This will help us to identify system and community changes that will encourage patients to seek, and clinicians to deliver, *the right care at the right time in the right setting*.

Ultimately, when it comes to individual situations, only the team that is caring for the patient can determine whether an event was *clinically preventable*. That means that eliminating all potentially preventable events is likely not a realistic goal, even in the long term. So while the entire potential \$1.9 billion in savings cannot be realized, it is an estimate that can serve as an overarching metric to be tracked over time and across settings to assess statewide progress. Additional and more focused research will help to determine realistic improvement targets.

Our health is greatly determined by factors outside of the clinician's office; to truly improve the health of individuals and communities, we cannot only focus on the care delivery system but must also move further upstream from the doctor's office or hospital and invest in broader approaches to community and population health. Better connecting the health care system and the greater community will result in more efficient and effective care delivery, and will improve both individual patient outcomes and overall community health. Minnesota has already implemented a number of innovative strategies that are successfully improving continuity of care and reducing health care spending, but additional opportunities to eliminate some potentially preventable health care events – in addition to focusing on disease prevention activities like increasing physical activity or reducing tobacco use – should be explored further.

An Introductory Analysis of Potentially Preventable Health Care Events in Minnesota



Introduction

The U.S. health care system is characterized by the ability to deliver a range of health care services, including some of the most complex, high-tech treatments currently available. But to ensure that we have the resources to pay for high-tech treatments also requires identifying and eliminating inefficiencies and waste.¹ Compared to the U.S. overall, Minnesota's health care system is viewed as efficient and cost-effective, often delivering high quality care to patients.² Minnesota's health care system, like those in other states, is also implementing payment and delivery system reforms such as performance-based contracting, patient-centered medical homes, and electronic exchange of clinical information to create a more rational and sustainable health care system. In this rapidly changing environment, our ability to identify opportunities for greater savings and efficiencies in the health care system without sacrificing quality of care, patient choice, or patient experience is becoming more important.

¹ See for example: Institute of Medicine (2010), the Healthcare Imperative: Lowering Costs and Improving Outcomes – Workshop Series Summary, Washington D.C.: The National Academies Press.

² Aiming Higher: Results from a State Scorecard on Health System Performance
<http://www.commonwealthfund.org/publications/fund-reports/2007/jun/aiming-higher--results-from-a-state-scorecard-on-health-system-performance>

What is a Potentially Preventable Event?

To be identified as potentially preventable for this report, an event had to fit a set of criteria drawn from clinical practice, empirical investigation, and the literature that suggests the event could have been prevented with the right circumstances, such as:

- Timely access to high quality care in outpatient settings;
- Improved medication management;
- Greater health and health system literacy; and
- Better coordination of care among providers across the system of care delivery and between patients, their families and health care providers.

This report explores one set of opportunities for health care system improvement by analyzing emergency department (ED) visits, hospital admissions, and hospital readmissions to identify potentially preventable health care events.

Not all of these events are likely clinically preventable, at an individual level. Even for those that are, the best opportunity for prevention may exist further upstream than the point of care, or even lie outside of the health care delivery system altogether and require improved community-based, public health interventions.

Ultimately, when it comes to individual situations where these criteria are met, only the team that is caring for the patient can determine whether an event was *clinically preventable* or, in other words, whether a patient's actual circumstances aligned with the general expectation that care could have been prevented through service delivery in

other settings. In other cases, preventing the event may require substantial system-level or upstream changes or public health investments.

This analysis is intended to contribute to an ongoing, more in-depth conversation about how to make Minnesota's health care system more effective and efficient in providing quality care for all Minnesotans. This report marks the first time we have been able to conduct a comprehensive empirical exploration of the volume of potentially preventable health care events in Minnesota and their associated cost. In order to dig deeper into the factors that underlie these events, identify the portion that may be realistically preventable in the short and medium term (and at what cost), and to develop strategies to target them, additional research is necessary. Ideally, this follow-up work will be done in collaboration with clinical experts and delivery system innovators.

While this is the first analysis in the nation where a state's All Payer Claims Database (APCD) was used to systematically assess the volume and impact of preventable health care events, the concept is widely familiar and the tools, including those used in this report, have been used by payers and others on smaller scale data, including in Minnesota. Aspects of preventable events are currently being used by some payers across the country as metrics in performance-based payment efforts.³

Summary of Findings

In 2012, Minnesotans experienced an estimated 1.3 million potentially preventable health care events, accounting for approximately \$1.9 billion in costs to public and private payers, or about 4.8 percent of total health care spending in the state that year.⁴ This volume of spending does not, however, represent real, near-term, potential savings because not all identified events were actually clinically preventable. Preventing many of

³For example, the following states use some components of PPEs in their Medicaid quality-based payment systems: Illinois, Massachusetts, Maryland, Texas and New York. In addition, a number of Blue Cross affiliates do so as well.

⁴Health Economics Program (2014), [Minnesota Health Care Spending and Projections](#), 2012. Minnesota Department of Health, Report to the Legislature.

these events would require investments upstream, outside of the medical care system and in support of patients' use of health care. The \$1.9 billion estimate should be seen as the outer boundary for improvement, and as a baseline metric that can be tracked over time. Additional and more focused research will help to determine realistic improvement targets.

The total number of potentially preventable events in Minnesota in 2012 breaks down as follows:

- Most, or about 1.2 million events, were potentially preventable emergency department visits that accounted for total spending of about \$1.3 billion;
- Nearly 50,000 events were potentially preventable hospital admissions that in total cost \$373 million; and
- About 22,000 events were hospital readmissions for which payers (health insurance companies, employers, and patients) spent \$237 million.

How often such events occur, the type of care for which they occur, and how much they cost varies greatly by the type of insurance involved. This is because patients with Medicare, Medicaid, or commercial insurance represent different age, economic, and health status characteristics; they also face different health care pricing contexts. Some of these differences are discussed in greater detail throughout this report, while others will be the subject of follow-up research.

Data Used in the Analysis

This study was conducted using Minnesota's All Payer Claims Database (MN APCD), a large repository of health insurance claims, enrollment information, and costs for services provided to Minnesota residents.⁵ The Minnesota Department of Health (MDH) analyzed administrative health care transaction data for approximately 4.3 million insured Minnesotans, which represents nearly 90 percent

of the state's residents with health insurance coverage. Data in the MN APCD were collected from both private and public insurance payers as required by Minnesota law.⁶

The MN APCD is updated continuously and currently includes data from 2009 through 2015. This study used a subset of the data for dates of service between 2010 and 2012 to include complete data for the elderly population and others who are Medicare beneficiaries. This data subset also provides a baseline for further benchmarking.

The MN APCD allows us to assess opportunities for greater health care efficiencies because it offers a comprehensive view of health care use in Minnesota. Because the MN APCD captures nearly all health care transactions for Minnesotans, it is well-representative of the state overall. It is also uniquely suited to drawing inferences for geographic regions of the state, thereby allowing a study of differences across Minnesota.

The MN APCD provides a unique advantage for the analysis of potentially preventable events because it includes data across the spectrum of care delivery, ranging from outpatient care to care in institutional settings. For example, for the analysis of potentially preventable hospital admissions, certain health care services can be classified as potentially preventable because they were preceded by care in a nursing home. Unlike in community settings (outside of health care institutions), there may have been specific opportunities for preventing a hospital admission. Similarly, a study of hospital readmissions permits analyzing factors preceding and following an initial admission, including identifying whether a patient had follow-up visits after a first hospital discharge.

Some data are not included in the MN APCD, either because state law does not authorize its collection, or because MDH tried to balance reporting burden with completeness of data when it developed the MN APCD. The following categories of data were **not** considered in this research:

⁵ Additional information about the MN APCD is available online: www.health.state.mn.us/healthreform/allpayer/

⁶ Minnesota Statutes, Chapter 62U.04.

- Health care claims for care provided to non-Minnesota residents, or paid for by the Indian Health Service, Veterans Affairs, Worker's Compensation, Tricare, or the Civilian Health and Medical Program of the Uniformed Services (CHAMPUS);
- Claims for care provided to the uninsured – such claims are typically not presented to payers of health care costs who are data submitters to the MN APCD;
- Medicare claims for the fee-for-services population with substance abuse conditions - the federal government currently withholds such claims from submission;
- Claims processed by health plans that have a minimal footprint in the state, with annual medical claims less than \$3 million or pharmacy claims less than \$300,000.

While these exclusions do not meaningfully bias the analysis, they are responsible for what are largely conservative estimates of potentially preventable events. If excluded claims were part of the MN APCD, the estimate of preventable events would be greater.

Methodology

A number of tools have been developed by academic, government, and health care researchers to categorize health care services – primarily hospitalizations and ED visits – as potentially preventable.⁷ Three types of information are typically used by researchers in the development of tools to identify potentially preventable health care events: the research literature, empirical examination of health care transaction data, and consultation with clinicians.

For this analysis, MDH relied on health claims analysis tools developed by Minnesota's 3M Health Information Systems because: (1) they integrate one uniform methodological approach across a series of preventable event categories, and (2) Minnesota health plans and providers have some familiarity with a subset of these tools:

1. The 3M Population Focused Preventables (PFP) tool was used for examining potentially preventable hospital admissions and emergency department visits.
2. The 3M Potentially Preventable Readmissions (PPR) grouping software was used to identify potentially preventable hospital readmissions.⁸

These tools assess the mix of diagnoses in administrative claims data, prior medical history, and medical procedures to identify potentially preventable health care events. They consider, among other things, whether care could have been potentially prevented or delivered in more preventive, lower acuity, outpatient settings. In the case of potentially preventable admissions, the algorithm also considers whether a patient was admitted from the community or an institutional setting, such as a nursing home, to assess the degree to which it was potentially preventable (see Figure 1).

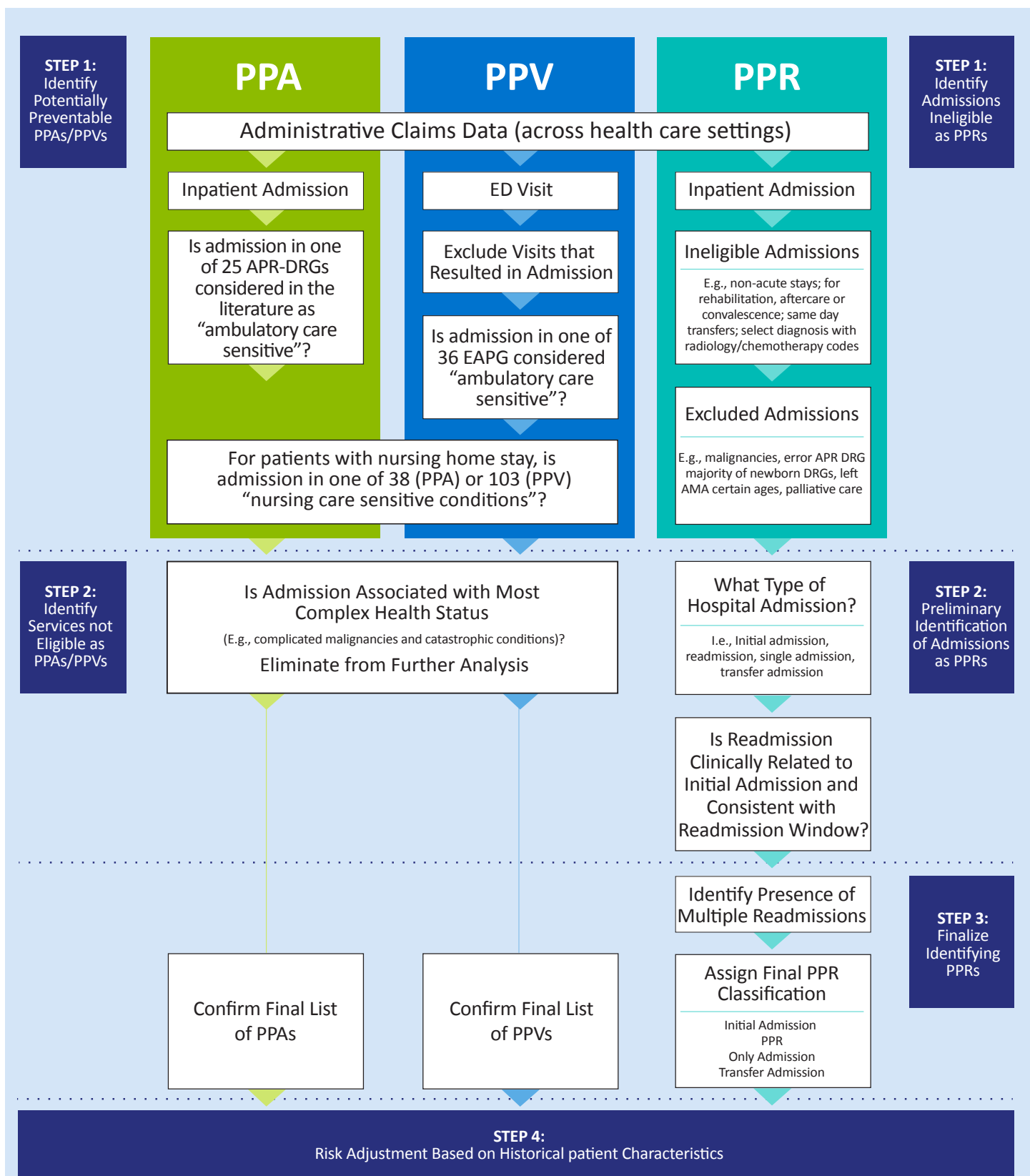
We also examined the volume and cost of potentially preventable events at a statewide level within broad categories of insurance coverage - Medicare, Medicaid (including MinnesotaCare), and commercial insurance. Costs of potentially preventable services were calculated by adding both the amounts paid by insurance and any reported patient cost sharing.

For purposes of assessing rates of preventable events by categories of payers; Medicare, Medicaid (and other state public programs), and commercial payers, data were risk adjusted to account for the fact that patient health risk is unequally represented among payers. MDH used an indirect standardization approach in which we calculated the "expected rate" for each type of preventable event within individual health status categories. Health status was assigned using 3M Health Information Systems risk adjusters based on health care use from a 12 month window preceding the 2012 observation period. For this report, we calculated the ratio of the observed (actual) rate of preventable events to the expected rate to assess whether payer-specific rates were above or below norms for all payers in aggregate and established by the statewide monthly rates of preventable events.

⁷ See http://www.qualityindicators.ahrq.gov/Modules/pqi_resources.aspx and <http://wagner.nyu.edu/faculty/billings/nyued-background>

⁸ The analysis in this paper used version 1.3 of the PFPs and version 32 of the PPR.

FIGURE 1: Overview of Process to Identify Potentially Preventable Events



SOURCE: Logic flow diagram adapted from 3M Health Systems user information. PPAs are Potentially Preventable Admissions, PPVs are Potentially Preventable Visits, PPRs are Potentially Preventable Readmissions, APR-DRGs are All Payer Refined Diagnostic Related Groups, and EAPGs are Enhanced Ambulatory Patient Groups.

Potentially Preventable Emergency Department (ED) Visits

Emergency departments (EDs) play a vital role in providing health care in Minnesota. In the event of an acute illness or traumatic injury, EDs provide the first line of care to patients in serious medical need. But EDs also quite frequently provide care for non-emergency conditions, including for people who lack insurance coverage.⁹

There are various reasons for why patients with minor medical conditions seek care in EDs when they could seek treatment in primary care settings. Among others, these include:

- Lack of connection with primary care providers;
- Inability to see a primary care provider after working hours or on the weekend;
- Ease of access to specialty providers; and
- Incomplete understanding of the health care system.

Reducing the use of EDs for non-acute conditions or for events that could be prevented or treated in lower-acuity settings has the opportunity to improve continuity of care and reduce health care spending. A number of innovative strategies in Minnesota demonstrate that potential. For example, Hennepin Health, a plan that provides a range of medical and social services to Hennepin County residents, focused on reducing ED services used by 8,000 enrollees. Hennepin Health has focused on reducing joblessness and homelessness, root level causes of health challenges, and found that from 2012 to 2013, ED use dropped by more than 9 percent and inpatient hospital admissions dropped by 3.2 percent. Their work on more complex patients resulted in even greater reductions of ED use.¹⁰

Community paramedicine (treating and coaching patients in their homes) is another innovation being used in Minnesota and elsewhere to reduce ED visits. One 2013 community paramedicine initiative delivered education and prevention to patients who had at least 10 ED visits in three months. The initiative helped reduce the number of visits for most patients (78 percent) to zero visits in 30 days following the intervention.¹¹

To identify a potentially preventable ED visit (PPV), the software algorithm uses an iterative process, first eliminating any ED visit that resulted in a hospitalization, then:

- Identifying and excluding cases where a surgical intervention or procedure was conducted;
- Assessing whether the ED visit met one of 36 medical conditions identified as potentially preventable;
- For patients with a recent nursing home stay, determining if the visit met one of an additional 103 conditions; and
- Conducting a series of internal consistency tests to determine if an identified visit was likely not preventable, including because it was for a trauma patient (see Figure 1).

In 2012, Minnesota residents used a hospital ED approximately 1.8 million times. Of these visits, about 67 percent, or 1.2 million, were considered potentially preventable using the assumptions outlined above.¹² The average cost for a PPV is lower by about one third than the average cost of an ED visit (about \$1,000 and \$1,600, respectively).¹³ In aggregate, PPVs consumed a substantial volume of health care resources that year, about \$1.3 billion.

⁹ See for example: Pines, L.U et.al, Emergency Department Visits for Non-urgent Conditions: Systematic Literature Review, The American Journal of Managed Care, 01/22/2013. Because MDH's analysis relies on health care claims paid by insurance companies or third party administrators, care for the uninsured that was paid for by patients themselves, remained unpaid or was provided at a partial or complete discount by providers, is not included in the analysis.

¹⁰ Editorial board. "Hennepin Health is Delivering Health Care Innovation." Star Tribune. August 21, 2014. <http://www.startribune.com/hennepin-health-is-delivering-health-care-innovation/272227551/>; July 17, 2015 9:00:00am.

¹¹ Allina Health Emergency Medical Services: Community Report. 2014. http://www.allinahealth.org/Medical-Services/Medical-transportation/Allina_Health_EMS_Community_Report/; July 17, 2015 11:05:00am.

¹² Although the algorithm used in this analysis differs substantially from that in other research, we found these estimates to be roughly comparable to the Billings et al. methodology, in that it also identified more than half of ED visits as potentially preventable (53.5 percent, unpublished research). Recent analysis for the state of New York produced rates of PPVs of 75 percent: <https://www.health.ny.gov/statistics/sparcs/sb/docs/sb4.pdf>; accessed June 6, 2015.

¹³ For the cost analysis of ED visits, room and board charges were removed for inpatient stays that followed an ED visit to approximate ED-specific costs. This estimate likely is somewhat overstated by other costs associated with an inpatient stay that could not be carefully identified using the available claims data.

As shown in Table 1, about two out of every three ED visits were identified as potentially preventable. Medicaid patients accounted for approximately 41 percent of all PPVs, and the rate of PPVs for Medicaid patients was greater than expected based on the underlying patient health risk of all patients combined (by 58 percent).^{14,15} Rates for Medicare and commercial payers were below expected levels (by 14 percent and 21 percent, respectively).

There are two primary factors that account for the higher than expected rates of PPVs in the Medicaid population:

- Medicaid members make up a disproportionately high percentage of overall visits to the Emergency Department. In 2012, Medicaid patients made up 14 percent of the population, but accounted for 40 percent of ED visits in the state;
- Based on observed health care utilization, Medicaid members with a PPV otherwise represent lower health care spending risk (55%, not displayed).

These high rates may be somewhat magnified by the fact that the indirect risk adjustment method only accounts for clinical risk factors. Socio-demographic population factors that may lead to higher rates of ED use have not been considered at this point.

Among PPVs, three categories of health care conditions

accounted for most (84.6 percent) of these visits. They include challenges with:

- Managing chronic conditions (40.1 percent)¹⁶: An example of such visits include care for asthmatic patients who were seen in the ED. Such care can often be prevented through timely access to outpatient care and increased patient empowerment, including through approaches characteristic of Health Care Homes.
- Treating non-infectious acute illnesses (27.6 percent): For example, care for patients seen for chest pain. While many patients with chest or abdominal pain are appropriately seen in the ED, patients with prompt access to a regular source of primary care can be appropriately treated in a physician office or diagnosed as a non-acute condition over the phone. Strong physician/patient relationships are particularly important in this case.¹⁷
- Treating acute infections that were treatable in primary care settings (16.9 percent): Examples of such visits include care for patients seen for an upper respiratory infection or urinary tract infection. Nearly all of these patients could be treated in outpatient settings. The literature shows that the key to avoiding ED visits for these individuals is timely access to the physician office, otherwise these individuals will be in enough discomfort to seek ED care.

TABLE 1: Number and Distribution of Potentially Preventable ED Visits by Payer (2012)

PAYER	# PPVS	# ED VISITS	PPVS AS % OF ED VISITS	AVERAGE COST OF PPV (\$)	ACTUAL TO EXPECTED PPVS
Medicare	331,857	526,496	63.0%	\$1,329.04	.86
Medicaid	493,057	726,174	67.9%	\$592.24	1.58
Commercial	359,952	553,254	65.1%	\$1,552.99	.79
Total	1,184,866	1,805,924	65.6%	\$1,052.71	

SOURCE: MDH/Health Economics Program, analysis of health care services provided in 2012 to MN residents, MN APCD (2015)

¹⁴ The observed rate of PPVs by payer was adjusted for the risk distribution in each population, using the Clinical Risk Group (CRG) risk adjustment system developed by 3M Health Systems.

¹⁵ These ratios are a measure of how many preventable events occurred compared to how many events were expected. A value of 1.0 indicates that there were exactly as many events as expected; results higher or lower than 1 indicate more or fewer events than expected. A difference from 1 measures the percent differences from expected rates for a given population.

¹⁶ Treatment for chronic illnesses does not include mental health, substance abuse, and malignancy.

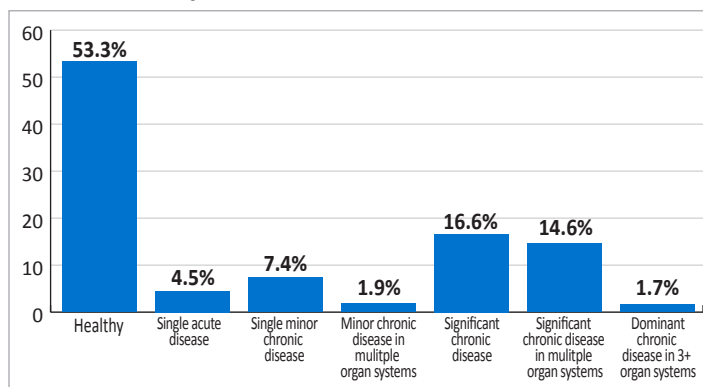
¹⁷ A recent survey of chest pain presenting to the PCP office found that 70% of the individuals with chest pain was caused by muscles surrounding the chest wall, stomach upset, and anxiety.

The specific symptoms and conditions for which people sought ED services that were potentially preventable cross a variety of clinical categories. The top four account for approximately 33 percent of all PPVs and include:

- Infections of the upper respiratory tract (9 percent);
- Abdominal pain (7 percent);
- Musculoskeletal systems and connective tissue diagnoses such as back pain (7 percent); and
- Chest pain (6 percent).¹⁸

Because many ED visits are for conditions that are primary care-treatable and because the PPV approach excludes visits that resulted in a hospital stay or were for trauma cases with surgical procedures, a sizable share of patients with PPVs did not have complex health conditions at their ED visit. As shown in Figure 2, patients who were identified as comparatively healthy based on their health care use pattern accounted for more than half of potentially preventable ED visits (53.3 percent).¹⁹ Almost one-third of patients with a PPV (31 percent) had a significant chronic disease in one or multiple organ systems.²⁰ Healthy individuals accounted for a smaller share of PPVs in the Medicare population (about 35 percent, not shown), compared with 62.2 percent and 58.5 percent for Medicaid and commercially insured patients, respectively.

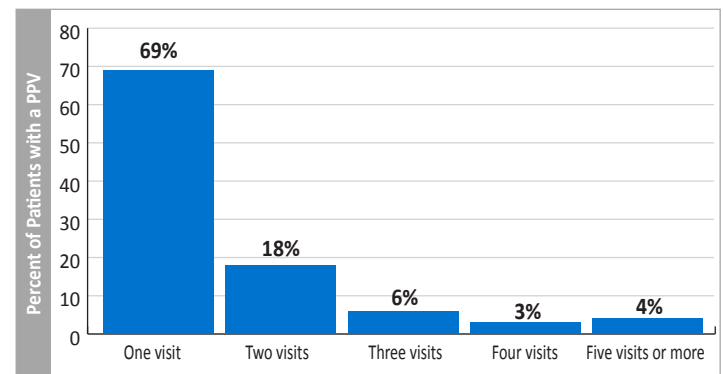
FIGURE 2: Distribution of Patient Clinical Risk for Patients with Potentially Preventable ED Visits, 2012



SOURCE: MDH/Health Economics Program, analysis of health care services provided in 2012 to MN residents, MN APCD (2015).

Our analysis found that approximately 710,000 individual patients accounted for the 1.2 million potentially preventable ED visits in 2012. Figure 3 shows that nearly 31 percent of patients with a PPV had more than one preventable visit, and seven percent, or about 50,000 Minnesotans, had four or more visits to the ED that were potentially preventable.

FIGURE 3: Frequency of Potentially Preventable ED Visits per Person, 2012



SOURCE: MDH/Health Economics Program, analysis of health care services provided in 2012 to MN residents, MN APCD (2015)

Patients with three or more potentially preventable visits to the ED differed from patients with fewer PPVs in the following ways, they were more likely to:

- Be a Medicaid patient. Half of all patients who had three or more PPVs were Medicaid patients;
- Be female. Sixty percent of patients who had multiple PPVs were female;
- Live in urban areas, and;
- Be older, on average.

There are small differences in the types of care received by patients with a higher number of PPVs. Patients who had three or more PPVs were less likely to receive care for an acute illness, an acute infection, or a traumatic injury. On the other hand, patients with multiple PPVs were more likely to receive preventable care for mental health and substance abuse or to manage chronic conditions.

¹⁸ Detailed data tables that include the volume of the most frequent diagnoses for all potentially preventable events are available online at: <http://www.state.mn.us/health/economics>

¹⁹ These patients did not have a medical history of having one or more chronic diseases, a dominant and metastatic malignancy, or a catastrophic illness.

²⁰ Classification of a patient as “healthy” is based on the patient’s claims history during the twelve month period of calendar year 2012. To reduce the likelihood that patients with short enrollment periods in 2011 and low claims volume are classified as “healthy,” the analysis was limited to patients who had at minimum a six month enrollment history.

Potentially Preventable Hospital Admissions

Potentially preventable hospital admissions (PPAs), similar to potentially preventable ED visits, represent an example of care that under the right circumstances could be delivered in more appropriate, lower acuity settings. Earlier research by MDH, using methods developed by the U.S. Agency for Healthcare Research & Quality (AHRQ), showed that about one out of 10 hospitalizations for Minnesota residents fell into this category.²¹ More recent, yet unpublished, analysis by MDH places the rate of preventable admissions closer to eight percent (2012).

For this report, MDH used the 3M Health Information Systems methodology to identify PPAs, employing a series of software tests on administrative claims data.²² The tests involve:

- Identifying which hospitalizations match one of 25 clinical conditions identified as “ambulatory care sensitive.” These are conditions for which access to ambulatory care and care management can avoid an admission.
- For patients with a stay in a residential nursing facility, evaluating whether the admission was for one of 38 conditions that could have, in most cases, been successfully prevented through appropriate treatment in the nursing home. These “nursing home care-sensitive conditions” include urinary tract infections, falls, and pneumonia.

- Excluding certain conditions (e.g., cancers) and disease states (e.g., amputation of extremities associated with diabetes) that are either not preventable or would have required interventions years before the hospital admission (see Figure 1).

Using this approach, MDH estimates that in 2012 there were nearly 50,000 hospital admissions for Minnesota residents that, with appropriate and timely outpatient or high-quality long-term care treatment, were potentially preventable. PPAs accounted for approximately one out of every ten hospital stays (10.6 percent) and consumed about \$372.6 million in health care spending. The average cost of a PPA was approximately \$7,500. The average cost for *any* hospital stay was \$10,012, about 33 percent higher than for a PPA.²³

Medicare admissions accounted for the largest share of PPAs (65 percent), as shown in Table 2. In aggregate, Medicare patients had the highest rate of PPAs relative to total admissions for that population (16.8 percent) and, after adjusting for the risk of the underlying Medicare population, Medicare PPAs were considerably higher than expected (53 percent). In contrast, the rates of PPAs for Minnesotans covered by commercial insurance or Minnesota public programs were noticeably lower than expected given the underlying risk distribution, 29 percent and 46 percent, respectively.

TABLE 2: Number and Distribution of Potentially Preventable Hospital Admissions by Payer (2012)

PAYER	# PPAS	ALL ADMITS	PPAS AS % OF ADMITS	AVERAGE COST OF A PPA	ACTUAL TO EXPECTED PPAS
Medicare	32,291	204,539	16.8%	\$ 7,809	1.53
Medicaid	8,706	126,818	7.8%	\$ 4,549	.71
Commercial	8,501	170,881	5.3%	\$ 9,609	.54
Total	49,498	502,238	10.6%	\$ 7,528	

SOURCE: MDH/Health Economics Program, analysis of health care services provided in 2012 to MN residents, MN APCD (2015)

²¹ Minnesota Department of Health, Health Economics Program, “Potentially Preventable Hospitalizations Among Minnesotans, 2007”, Issue Brief, Nov. 2010.

²² This method differs in three ways from the earlier analysis: (1) it relies on a broader set of conditions, including seizures, migraines, mental health and substance abuse disorders; (2) it considers patients’ health history in identifying PPAs and excludes admissions for patients with chronic conditions; and (3) it separately assesses care for patients from community and nursing home settings to identify cases where care in institutions should have prevented an admission, such as for falls.

²³ The distribution of inpatient costs for PPAs and hospitalizations overall was capped, or windsorized, at the third standard deviation above the mean.

Four primary reasons account for the majority of PPAs in Minnesota in 2012:

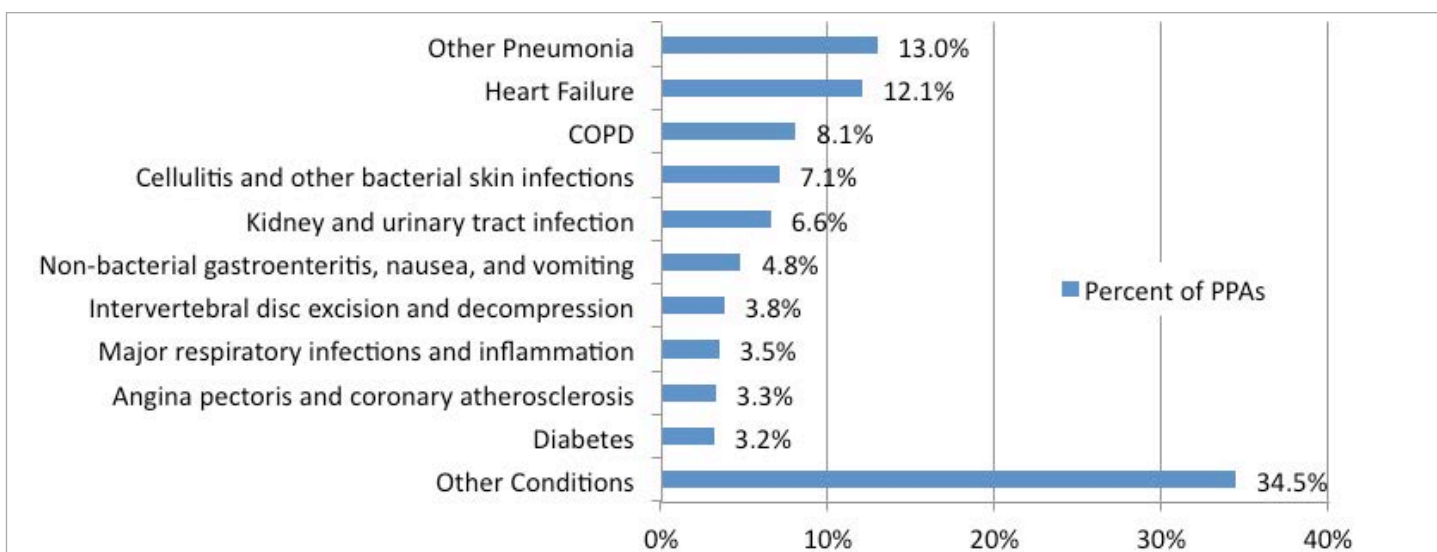
- **Timely access to outpatient services:** Nearly half (48.8 percent) of PPAs were for patients who used care that could have likely been prevented with timely access to outpatient services. Patients with pneumonia, for example, could in many cases avoid a hospital stay with early assessment of initially benign respiratory infection or bronchitis and access to antibiotics.
- **Appropriate coordination and management of chronic conditions:** About one-third (31.9 percent) of PPAs were for patients with conditions where appropriate primary care coordination and management should have prevented the admission. Examples of such admissions include inpatient care for asthma and diabetes admissions. Frequent communication between health care professionals and patients at risk of admission about adherence to prescription drug regimens has been shown to be effective in lowering rates of admission.
- **Appropriate nursing home care:** For 12.8 percent of PPAs, patients had been treated in nursing homes prior to their admissions. Appropriate access to primary care

at the nursing home for conditions such as urinary tract infections, non-bacterial gastroenteritis, and nausea and vomiting could have often prevented the need for a hospital admission.

- **Potential overuse:** Finally, about 6.5 percent of PPAs were for admissions that indicated potential overuse of health care services, including back surgery, angioplasties, and hysterectomies. Medication, exercise, physical therapy, and other lower intensity, non-surgical interventions are alternatives to many of these major surgeries and could effectively prevent a hospital stay.

Compared with preventable ED visits, potentially preventable admissions were concentrated in relatively fewer medical conditions. As shown in Figure 4, the most frequent ten conditions accounted for 65.5 percent of all PPAs in 2012. Two conditions (out of 314 possible diagnoses clusters or All Payer Refined Diagnoses Related Groups), pneumonia that was not diagnosed as bronchiolitis or brought on by the respiratory syncytial virus and heart failure, accounted for more than 10 percent of all PPAs. (A more detailed distribution of clinical conditions underlying PPAs in Minnesota in 2012 is available online: www.health.state.mn.us/health/economics.)

FIGURE 4: Distribution of Potentially Preventable Hospital Admissions by Condition, 2012



* "Other pneumonia" is pneumonia that excludes bronchiolitis and Respiratory Syncytial Virus (RSV)

SOURCE: MDH/Health Economics Program, analysis of health care services provided in 2012 to MN residents, MN APCD (2015)

Similar to the analysis of potentially preventable ED visits, patients without a previously diagnosed chronic condition made up a substantial share of patients with a preventable hospitalization (37.4 percent). However, as shown in Figure 5, patients with a significant chronic disease in one or multiple organ systems represented the largest share of patients with preventable admissions (47.4 percent).

The majority of patients (87.8%) who had a potentially preventable hospitalization experienced only one such event in 2012 (data not shown graphically). Another 11.1 percent (or 4,800 patients) had two or three potentially preventable hospitalizations. This is distinct from the analysis of preventable emergency department visits that indicated nearly one-third of patients with a PPV had more than one such event.

Patients who had multiple PPAs differ from those who had only one event in a few ways. Patients who had multiple preventable hospital admissions:

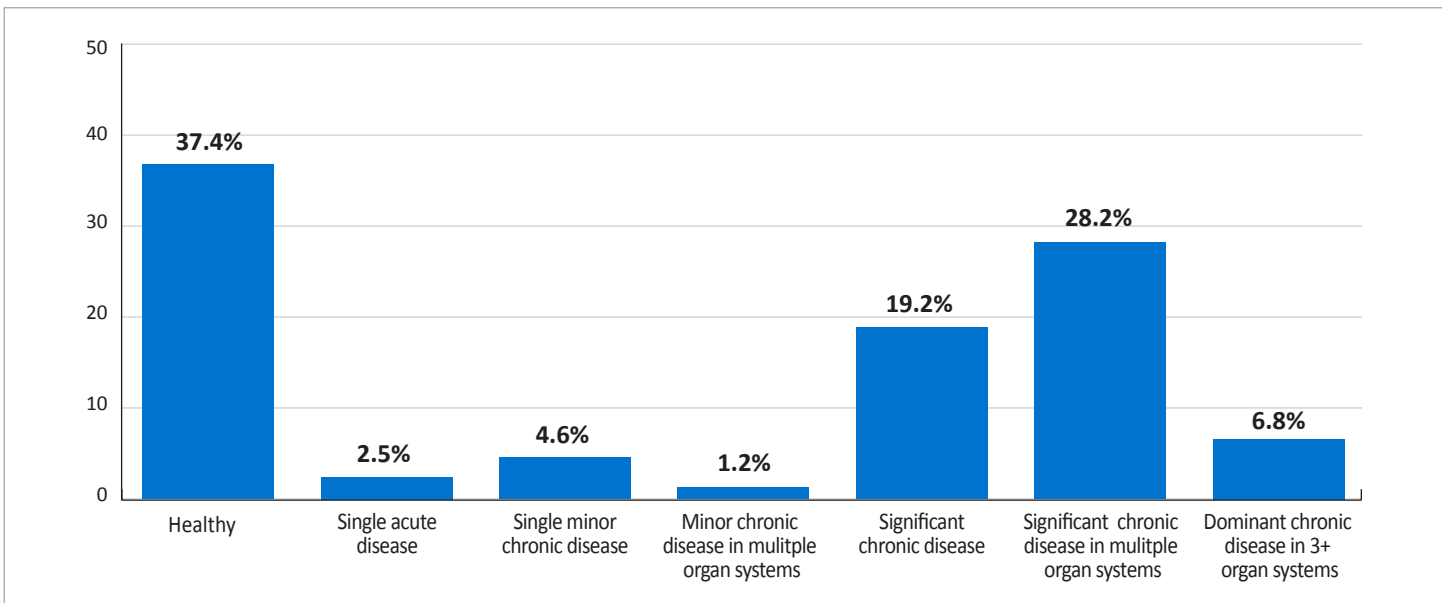
- Had a higher degree of underlying clinical risk burden and were substantially more likely to be assigned into one of the top two most severe risk categories (significant malignancies or dominant chronic diseases); and

- Were less likely to be classified as healthy.

Patients with a single PPA in 2012 were more likely to have been admitted for an event that could have been prevented through timely primary care access, compared to patients hospitalized with multiple PPAs (53.2 percent and 35.8 percent, respectively). Medicare patients accounted for a disproportionately high percentage of PPAs, independent of how many events they experienced.

Finally, there are a few interesting differences in the conditions that drive patients to have multiple preventable hospitalizations. Conditions with elements of chronicity or cyclical care, such as heart failure or chronic obstructive pulmonary disease (COPD), account for a higher proportion of preventable hospitalizations for patients with multiple PPAs. Comparatively, conditions that are more acute, such as kidney infections, account for a higher proportion of preventable hospitalizations for patients with a single preventable admission.

FIGURE 5: Distribution of Patient Clinical Risk for Patients with a Potentially Preventable Hospital Admission, 2012



SOURCE: MDH/Health Economics Program, analysis of health care services provided in 2012 to MN residents, MN APCD (2015)

Potentially Preventable Readmissions

Readmissions to hospitals shortly after a discharge are viewed as potentially preventable with improvements in care coordination, communication across the delivery spectrum, and discharge planning. Reducing 30-day readmissions (readmissions that occur within 30 days after an initial hospital discharge) has been a priority for hospitals and payers for a number of years, especially because of payment incentives established by the Centers for Medicare & Medicaid Services (CMS).²⁴ In Minnesota, a wide range of strategies designed to reduce preventable readmissions have been developed by members of the Reducing Avoidable Admissions Effectively (RARE) Campaign and implemented by participating providers.²⁵ The RARE Campaign estimates that as many as 7,975 admissions were prevented between 2011 and 2013, in part due to their collective efforts.²⁶

Recognizing the importance of reducing readmissions in hospitals, analysts have developed a variety of tools to assess the volume and rates of readmissions. The most common technique is the one used by CMS²⁷ to estimate the relationship of actual to predicted readmissions for four condition groups that include: (1) heart attack,²⁸ (2) heart failure, (3) pneumonia, and (4) joint replacements for hips and knees. Readmissions for these conditions can be for any reason and the focus is typically on a single readmission rather than a series of events.

For the analysis in this report, we used the 3M Health Information Systems methodology to identify potentially preventable readmissions (PPRs) in 2012. Instead of

focusing on just four conditions (the approach taken by CMS), the 3M effort casts a broader net by establishing the following decision rules for its approach:

- Readmissions must be preceded by a previous hospitalization within a 30-day window;²⁹
- Readmissions must be “clinically related” to the initial hospitalization. For example, a trauma event requiring hospitalization after an initial admission for COPD would not be considered potentially preventable;
- Readmissions must be stand-alone hospitalizations. Transfers between hospitals and planned admissions are not considered to be a PPR; and
- Readmissions in certain clinical categories, such as malignancies, multiple traumas, burns, and birth-related hospitalizations are excluded from the final estimate because follow-up care for these cases is generally complex and extensive.

The methodology used for this report also allows assessing to what extent *multiple* hospitalizations follow an initial hospitalization. When consecutive visits to the hospital within consecutive 30-day windows are clinically related, the initial stay and all subsequent readmissions are grouped together in a “chain” of readmission events.³⁰

As shown in Table 3, approximately 22,000 hospital admissions in 2012 were potentially preventable readmissions. At an overall average cost of \$10,749, these readmissions amounted to approximately \$237 million in health care spending.³¹ (This estimate does not include the cost of the initial admissions.)

²⁴ Reimbursements were decreased for hospitals with readmissions in excess of an expected or tolerable number. This policy was implemented initially and applied to hospital discharges beginning October 1, 2012. For more information, see: <http://www.cms.gov/Medicare/Medicare-Fee-for-Service-Payment/AcuteInpatientPPS/Readmissions-Reduction-Program.html>

²⁵ Reducing Avoidable Readmissions Effectively. For more information, see: <http://www.rarereadmissions.org/>

²⁶ For additional detail see: <http://www.rarereadmissions.org/>

²⁷ For more information, see: <https://www.qualitynet.org/dcs/ContentServer?c=Page&pagename=QnetPublic%2FPage%2FQnetTier2&cid=1228772412458>

²⁸ Acute myocardial infarction, or AMI

²⁹ Alternative time spans can be selected. For this analysis, MDH's approach aligned with the most widely used metric.

³⁰ The number of readmissions and readmission chains in this report represent low estimates that result from current characteristics of the MN APCD. At this point, the MN APCD does not collect specific discharge dates for hospital stays. Discharges are constructed analytically based on the presence of hospitals claims within a 48 hour window. This results in not consistently being able to identify readmissions that occurred within 1 or 2 days of the discharge, the days at which typically most readmissions have occurred. Our analysis of Medicare data estimates a potential undercount of 12-15 percent. Additional work is needed to assess how the lack of a discharge date impacts readmission analysis.

³¹ These estimates were truncated at three standard deviations above the mean to remove the effect of potential outliers from the analysis.

Medicare enrollees have systematically higher rates of hospitalization than people with Medicaid coverage or commercially insured individuals. Medicare enrollees made up about 15.5 percent of the population in 2012 and accounted for about 40 percent of all admissions that year, in part because of their age and health risk structure. Medicare patients also accounted for a disproportionately higher share of potentially preventable hospital *readmissions* in 2012 (54 percent).

The raw rate of readmissions in 2012 - the number of readmissions divided by total number of hospitalizations - was 5.8 percent, 4.3 percent, and 2.7 percent for Medicare, Medicaid, and commercially insured patients, respectively. In aggregate, about four out of 100 admissions to the hospital in 2012 were potentially preventable readmissions.

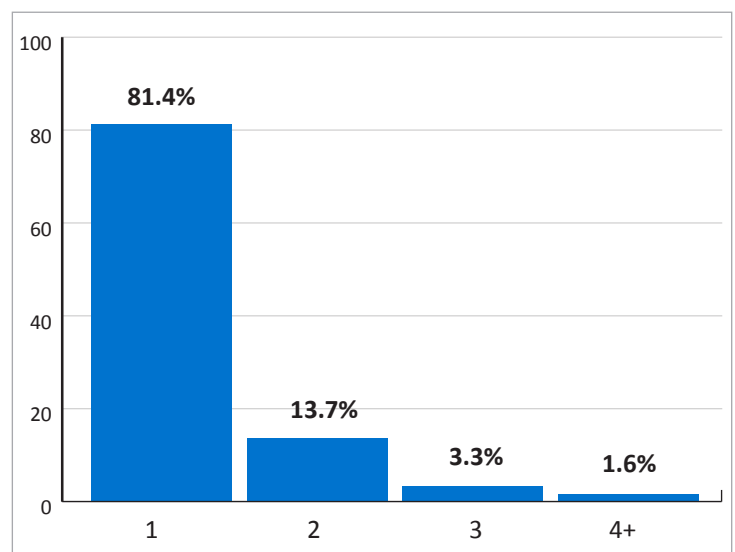
Again, rates of readmissions at the payer level were risk adjusted using an indirect standardization similar to the one used to adjust rates of PPAs and PPVs. The approach uses clinical risk, severity of illness, and the “potential eligibility” of an initial hospitalization to be a readmission to calculate expected rates of readmissions. As shown in Table 3, in an all-payer environment this method produces a high number of expected readmissions, resulting in a low ratio of actual to expected readmissions (89 percent, 99 percent and 77 percent for Medicare, Medicaid, and commercial, respectively).

The ratios below do not illustrate that there were variations in the rate of actual-to-expected readmissions for specific conditions. For example, the number of actual readmission events for specific conditions in the

Medicare population can range from 25 percent below expected to 25 percent above. In addition, ratios of actual to expected readmission events for specific conditions can differ depending on the severity of illness in the initial hospitalization.

When a hospitalization is followed by a potentially preventable readmission within 30 days of a discharge it generally remains a single “event.” However, as shown in Figure 6, 20 percent of initial admissions in 2012 were followed by “chains” of readmissions. These multiple readmissions were clinically related to the initial hospitalization and fell into consecutive 30-day windows of consecutive discharges following the initial admission.

FIGURE 6: Distribution of Readmission Chains in Minnesota Hospitals, 2012



SOURCE: MDH/Health Economics Program, analysis of health care services provided in 2012 to MN residents, MN APCD (2015)

TABLE 3: Volume and Distribution of Potentially Preventable Readmissions, by Payer (2012)

PAYER	# PPRS	AVERAGE COST OF A PPR	ALL HOSPITAL ADMISSIONS	PPRS AS % OF ALL ADMISSIONS	ACTUAL TO EXPECTED READMISSION
Medicare	11,933	\$9,779.72	204,539	5.8%	.89
Medicaid	5,490	\$8,943.28	126,818	4.3%	.99
Commercial	4,682	\$15,778.06	170,881	2.7%	.77
Total	22,105	\$10,748.88	502,238	4.4%	

SOURCE: MDH/Health Economics Program, analysis of health care services provided in 2012 to MN residents, MN APCD (2015)

Unlike potentially preventable hospital admissions, potentially preventable readmissions are not tightly concentrated among a few condition categories. The three most frequent conditions account for approximately 15.2 percent of all readmissions:

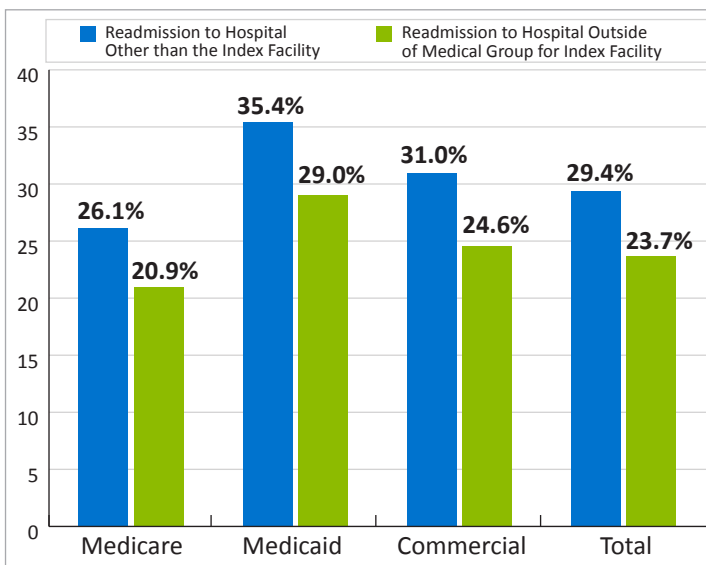
- Heart failure (6.6 percent);
- Blood infection (septicemia) and disseminated infection (5.1 percent); and
- Major depressive disorder and other unspecified psychoses (3.5 percent).

For the Medicaid and commercially insured patient populations, readmissions for behavioral health and substance abuse-related cases make up a sizable share of all readmissions (26 percent and 17 percent, respectively). Substance abuse conditions for Medicare patients account for a comparably small portion of readmissions (5 percent). However, this is, to a substantial extent, the result of data sharing provisions adopted by CMS that prohibit the sharing of data associated with substance abuse-related care.

Our analysis in Figure 7 shows that while the majority of readmissions occur at the same hospital as the original admission (the index admission), nearly 30 percent of readmissions take place at another hospital.³² If the analysis is broadened to look at admissions and readmissions within a medical care system or network rather than just at a single facility, the volume of “leakage” drops to less than 24 percent. Both categories of leakage are most pronounced for the Medicaid population, suggesting higher challenges with care coordination and management, and a potentially more mobile population.



FIGURE 7: Percent of Patients with a Potentially Preventable Readmission Readmitted to the Index Hospital



SOURCE: MDH/Health Economics Program, analysis of health care services provided in 2012 to MN residents, MN APCD (2015)

There are some systematic differences between patients readmitted to the facility of their initial admission and those readmitted to another facility. For example:

- Patients who were initially admitted for a mental or a behavioral health condition, such as a depressive disorder, bipolar disorder, or schizophrenia, were more likely to be readmitted to another hospital. This could be driven by, among other factors, poor care coordination and management, or challenges associated with managing both inpatient and outpatient psychiatric treatment capacity.³³
- Patients initially admitted for an acute medical condition such as heart failure, pneumonia, or septicemia were more likely to be readmitted to the same facility where the initial hospitalization occurred.
- Lastly, elderly patients and young children were more likely to be readmitted to the same facility than older children and non-elderly adults. Identifying the extent to which this is driven by hospitals specializing in care for certain populations, or if there are other explanatory factors, requires more analytic investigation.

³² This analysis is somewhat affected by the absence of a discharge date and the missing 1st/2nd-day readmissions noted earlier. Without a discharge date, same-hospital readmissions will not be identified, while readmissions to different hospitals would.

³³ Some research in Minnesota shows that behavior health patients often remain in the hospital unnecessarily long, because they lack access to outpatient follow-up care. Similarly, early diagnosis and management of behavioral health issues could have prevented a portion of hospital stays in the first place.

Additional Research

As mentioned in the introduction, the analysis for this report represents the first look at potentially preventable events in Minnesota. It is focused primarily on identifying the potential volume of such events across the state and estimating associated health care spending. To turn this initially high-level analysis into actionable efforts aimed at reducing potentially preventable health care services and improving care delivery for patients will require significant additional research effort.

Additional research efforts will be most effective if grounded in collaborations with the community, clinical expertise provided by practitioners, and existing delivery system experience with addressing factors associated with potentially preventable health care events. The following outlines a potential research agenda:

- **Variation in Potentially Preventable Events (PPEs):**

The volume of PPEs identified in this report represents a likely upper-boundary of preventable emergency department visits, hospital admissions, and hospital readmissions. Eliminating all events might not be a realistic goal, even in the long term. Research into the variation of rates of PPEs will help to identify the fraction of health care events that are potentially preventable in the short and medium term. It will also help to identify “best achievable rates” by payer, geography, and other stratifications as benchmarks against which to strive.

- **Hot-spotting:** While substantial and lasting reductions in PPEs may require community and practice-wide changes, near term initial success may be possible by focusing on certain patient populations or conditions. Follow-up research might use the following questions to identify areas of initial focus:
 - Are patients with multiple PPVs seen for the same conditions, and what does that signal about factors responsible for preventable utilization?
 - Are certified Health Care Homes more successful at avoiding ambulatory care sensitive health care utilization?
 - Do patients who are readmitted to a facility other than the one where the initial admission occurred appear to have a primary care provider who manages their care (can they be attributed to a care provider), or do they see multiple providers which makes care coordination more challenging?
 - Is there some concentration of condition categories for patients admitted to inpatient care from residential nursing care facilities?
- **Longitudinal Analysis:** Minnesota’s care delivery market is undergoing rapid change due to changes in financial incentives, greater availability of data on relative performance, and a broader set of quality improvement tools. Research on longitudinal trends will help identify progress and opportunities for further ongoing improvement.



Discussion and Policy Implications

Health care spending in the United States represents a significant and growing share of the economy. Although Minnesota's health care system is widely viewed as effective and efficient, as evidenced by strong scores on publicly reported quality metrics such as levels of health care service use by Medicare patients and population health statistics, health care spending still accounts for a sizable share of the economy. In 2012, 13.5 percent of the economy, or a total of \$39.8 billion, was spent on health care in Minnesota. This number of health care spending in the state is expected to nearly double by 2022, to reach a projected \$76.5 billion.³⁴ This will create affordability challenges for individual consumers, businesses, and other health care purchasers (including the government), and raises questions about long term sustainability.

There is persistent evidence that even efficient, high-quality health care systems are likely characterized by overuse, underuse, and misuse of health care services.³⁵ By some estimates, these categories account for as much as 30 percent of health care spending.³⁶ At the same time, we know that an individual's health is greatly determined by factors outside of the clinician's office; genetics, behavioral choices, and community or environmental factors all play a role. Considering all contributors to an individual's health leads us to the conclusion that to improve the health of individuals and communities, we cannot only focus on the care delivery system but must also move further upstream from the doctor's office or hospital and focus our investments on broader approaches to community and population health.

Given these complex and intertwining issues, policy-makers, health care purchasers, health care providers, and researchers are faced with difficult choices as they look for opportunities to reduce potential wasteful spending in the health care system while also managing health care spending growth at sustainable levels and improving care quality and patient experience.

One promising area of investigation is to identify and reduce potentially preventable health care events and to shift care into lower-acuity settings. The concept is compelling - with timely access to high-quality ambulatory and preventive care, with more appropriate care coordination in outpatient or home-based settings, or with access to services related to transportation, housing, or other supports, some preventable health care events could be eliminated.

However, precisely identifying events that could actually be preventable is challenging because, among other reasons, medical care remains both a science and an art, meaning two similar-appearing clinical cases may require different health care responses. In addition, patient preferences, cultural norms, socio-demographic factors, and patients' economic realities may contribute to delivery of health care services that are identified as potentially preventable.

These baseline estimates of the volume and cost of preventable events in Minnesota are intended to offer a new perspective on potential improvements in how we deliver care, by highlighting the characteristics of patients who experience care that may not be as well-coordinated as it could be. This will help us to identify system and community changes that will encourage patients to seek, and clinicians to deliver, the right care at the right time in the right setting. This report can serve as the beginning point for a broader discussion about how to:

- Best identify "pockets" of preventable events that could be reduced in the short and medium term, and
- Develop targeted strategies for reducing the volume of these events to help achieve Minnesota's statewide goals of having an efficient, high-quality, patient-centered care system that allows all patients to get the right care where and when they need it – and is financially sustainable.

³⁴ MDH, Health Economics Program, Minnesota Health Care Spending and Projections, 2012, Report to the Minnesota Legislature, June 2014.

³⁵ See for example: Peter R. Orzag, "The Overuse, Underuse and Misuse" of Health Care", Congressional Budget Office, Testimony before the Committee of Finance United States Senate. July 17, 2008; Minal S. Kale, Tara F. Bishop, Alex D. Feldman and Salomeh Keyhani, "Trends in the Overuse of Ambulatory Health Care Services," JAMA Internal Medicine, 173(2), 2013 and Center for the Evaluative Clinical Sciences, "Preference Sensitive Care," A Dartmouth Atlas Project Topic Brief, 2007.

³⁶ See for example: Donald M. Berwick and Andrew D. Hackbarth, "Eliminating Waste in US Health Care," JAMA, 307(14), April 11, 2012 and Mark Smith, Robert Saunders, Leigh Stuckhardt, J. Michael McGinnis, (eds), Institute of Medicine, Committee on the Learning Health Care System in America: Best Care at Lower Cost: Path to Continuously Learning Health Care in America. Institute of Medicine, The National Academies of Science, 2012.

As measured by the total volume of spending for potentially preventable health care events (\$1.9 billion) in 2012, the scope of opportunity is substantial. Even a 10 percent reduction in potentially preventable events represents significant opportunity, including to redirect spending upstream and to lower acuity settings of health care. For patients, this could mean earlier and more effective interventions, improved quality of care and quality of life, and lower health care costs, as well as lower potential for lost work time, time away from school, or other non-health care costs.

This analysis also highlights, even at this early stage, areas of potential overuse and underuse for payer groups, such as the higher than expected rate of potentially preventable ED visits in the Medicaid program, patients who experience multiple preventable events in a 12 month period, and missed opportunity for appropriate preventive care in nursing homes.

Minnesota providers and communities are already beginning to implement a number of innovative strategies that are successfully improving continuity of care and reducing health care spending. But our health is greatly influenced by factors outside of the clinician's office. This means in order to truly improve the health of individuals and communities, we cannot only focus only on the care delivery system. We must also move further upstream from the doctor's office or hospital and invest in broader approaches to community and population health. The findings reported here point to a number of strategies that could be pursued, within health care systems or more broadly across the state, to reduce potentially preventable events. These strategies exist both within and outside of the health care delivery system. Potential policy levers that could have an impact on reducing avoidable events include:

- Ensuring all patients have access to timely, high-quality

preventive care in outpatient settings, and a usual source of care or health care home;

- Ensuring that patient/family engagement is at the core of health care delivery, with a focus on the availability of information or guidance about preventive care and treatment that is accessible to patients with varying levels of health literacy and in multiple languages;
- Improving coordination of care across settings of care, in particular between long term care settings and hospitals, but also with home care;
- Taking full advantage of support services like transportation, interpreter services, and case management;
- Strengthening the system of primary care, including by expanding the array of professionals as part of the team;
- Making use of emerging providers, such as community paramedics or community health workers, to provide care coordination and connect vulnerable patients to social supports that can help them avoid hospitalizations or ED visits;
- Ensuring that secure electronic exchange of clinical information occurs effectively and in real-time across settings and provider systems for care coordination; and
- As recommended by the RARE campaign, improving comprehensive discharge planning, medication management, and transition care support/transition communications.

As noted earlier, extending and updating these estimates, prioritizing the populations and preventable health care events to target, and working with clinicians and patients to identify and accelerate best practices will be critical next steps in this work.

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