4. HIGH-COST PATIENTS

Five percent of patients account for nearly half of all spending among the Medicare and commercial populations in Massachusetts. Of these patients, 29 percent remain in the top five percent by spending the following year.

One-fourth of all patients represent over 85 percent of total expenditures in the U.S. health care system.[1] This group includes many medically complex patients, for whom improved management may yield better outcomes at lower costs. Accurately identifying and focusing interventions for this population has the potential to produce savings and quality returns on investment. For example, reducing the spending for this population by 3.5 percent would save an equivalent amount as a 20 percent reduction for the other three-fourths of the population.

In this chapter, we define "high-cost patients" as the top five percent of patients in our sample by spending in a given year and "persistently high-cost patients" as high-cost patients who remain in the top five percent the following year.[i,ii] Since their costs recur in multiple years, persistently high-cost patients may be easier to identify and their high costs present a larger savings opportunity.

The sample for this analysis covers patients enrolled with Medicare and with the three largest commercial Massachusetts payers. This sample does not include Medicaid or pharmacy costs due to current data limitations. Given the known concentration of MassHealth spending among certain groups of beneficiaries, such as disabled adults and seniors, future analysis of MassHealth data is of particular interest to the Commission.[2]

In this chapter, we first analyze the concentration of spending in Massachusetts, the persistence of spending

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[i] We define high-cost based on level of spending in claims-based medical expenditures. Higher spending may be due to greater medical complexity, higher utilization, or use of higher-priced providers (provider mix).

[ii] The sample was limited to patients who had at least six months of enrollment in both 2010 and 2011 and costs of at least $1 in each year. Figures do not capture pharmacy costs, payments outside the claims system, Medicare cost-sharing, or end-of-life care for patients who died in 2010 or 2011.

Table 4.1: Spending concentration in Massachusetts

Claims-based expenditures (excluding pharmacy spending), dollars, 2010

	Medicare		Commercial	
	Expenditure threshold*	Percent of total expenditures	Expenditure threshold*	Percent of total expenditures
Top 1%	$99,600	15.3%	$48,900	22.4%
Top 5%	$45,800	42.0%	$16,500	45.0%
Top 10%	$26,900	60.1%	$9,600	58.6%
Top 20%	$11,000	78.1%	$4,900	73.3%
Top 50%	$2,600	94.5%	$1,600	91.8%

*Minimum expenditures for patient in that group.
SOURCE: All-Payer Claims Database; HPC analysis

among high-cost patients, and the characteristics and predictors of high-cost and persistently high-cost patients. Next, we provide examples of interventions and strategies intended to reduce costs for high-cost and persistently high-cost patients.

4.1 Concentration of spending

In 2010 in Massachusetts, high-cost patients accounted for 45 percent of spending among the commercial population and 42 percent among the Medicare population (**Table 4.1**). National results for all-payer data show a comparable concentration of spending.[1] Spending for the average high-cost patient in 2010 was 13.8 times greater than the average for all other patients among the Medicare population; the comparable figure was 15.6 times greater among the commercial population.

4.2 Persistence of spending among high-cost patients

Among the Medicare and commercial populations, 29 percent of 2010 high-cost patients remained high-cost in 2011 and therefore were persistently high-cost patients (**Figure 4.1**). National all-payer results show a similar proportion of persistently high-cost patients.[3]

Figure 4.1: Persistence among high-cost Medicare and commercial patients in Massachusetts
Claims-based medical expenditures (excludes pharmacy spending) in 2010 and 2011
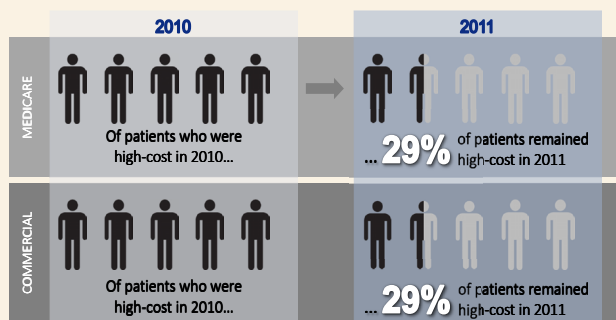
SOURCE: All-Payer Claims Database; HPC analysis

Persistently high-cost patients also spent more than other high-cost patients during the same time period. On average, spending for Medicare persistently high-cost patients was 1.3 times greater than for Medicare non-persistently high-cost patients in 2010. Similarly, spending for commercial persistently high-cost patients was 1.8 times greater than for commercial non-persistently high-cost patients.

4.3 Characteristics and predictors of high-cost and persistently high-cost patients

To better understand high-cost and persistently high-cost patients, we examined three sets of patient characteristics: clinical conditions, region of residence, and demographics such as age, gender and income.[iii] First, we analyzed characteristics and predictors of high-cost patients, and then conducted similar analyses of persistently high costs, limiting the sample to high-cost patients in the base year. Using the APCD, we conducted two types of analyses:

- Descriptive analyses, which examined the relationship between one patient characteristic (such as a condition or region) and one spending variable (such as cost). This provides a profile of high-cost patients while highlighting characteristics that may be highly relevant from a clinical or policy point-of-view.

- Predictive analyses, which examined the impact of a series of patient characteristics on the likelihood of being either a high-cost or persistently high-cost patient and which used statistical techniques to isolate the impact of each characteristic while controlling for the impacts of the others. This aids in more precisely identifying patient characteristics for attention and the underlying drivers of high costs.

- Descriptive and predictive analyses may yield different but complementary results. For example, the descriptive analysis might indicate that spending is high in a particular region. The predictive analysis would suggest whether the difference was driven by different rates of chronic conditions in the region, higher spending in the region controlling for clinical conditions, or a combination of both factors.

4.3.1 Clinical conditions

Characteristics of high-cost and persistently high-cost patients

Certain clinical conditions are more likely to be prevalent among high-cost patients.[4] In Massachusetts in 2010, 13 conditions occurred at least four times more often among commercial high-cost patients than the rest of the commercial population (**Table 4.2**).[iv] In addition, there were several conditions which did not meet this threshold, but are nonetheless of interest because are highly prevalent and slightly more common among high-cost patients, including chronic medical conditions such as arthritis, asthma, and diabetes. Among the Medicare population, many of the same clinical conditions occurred more frequently among the high-cost population, though the differences were less pronounced.[v]

Furthermore, high-cost patients are frequently charac-

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iii Patient income is not directly available in the APCD. We used median household income in a patient's zip code of residence as a proxy for individual income.

iv We used Lewin Group's Episode Risk Groups (ERG) tool to define clinical conditions. ERGs are risk measures based on observed episodes of care and demographic measures. Under optimal conditions, such measures incorporate pharmacy data, but certain constraints prevented the utilization of this data. We selected 23 clinical conditions to present in the text, emphasizing common chronic conditions and conditions particularly prevalent among high-cost patients.
v This more limited effect is expected. Medicare beneficiaries on average have higher spending levels, including a higher threshold for entering the top five percent. For example, a patient with $30,000 in spending related to a single high-cost condition would be in the top five percent in the commercial population, but not in the Medicare population.

Table 4.2: Prevalence of selected clinical conditions[*]

Percent of population; ratio of prevalence between high-cost patients and the rest of the population, 2010

	Medicare		Commercial	
	Overall prevalence	Prevalence among high-cost	Overall prevalence	Prevalence among high-cost
Arthritis	28%	1.6x	10%	3.0x
Asthma	13%	2.1x	7%	1.9x
Cardiology	21%	2.1x	7%	3.3x
Diabetes	23%	1.7x	5%	2.7x
Endocrinology	12%	4.0x	5%	4.3x
Hematology	9%	3.3x	3%	4.1x
Hepatology	4%	3.3x	2%	5.6x
High-cost cardiology	21%	3.0x	2%	7.4x
High-cost gastroenterology	8%	4.7x	3%	6.7x
High-cost pulmonary conditions	4%	9.8x	0%	21.2x
Hyperlipidemia	24%	0.6x	10%	1.2x
Hypertension	45%	0.7x	14%	1.9x
Infectious diseases	2%	14.2x	0%	17.5x
Malignant neoplasms (cancer)	11%	1.9x	3%	7.6x
Mental health	14%	2.6x	7%	2.1x
Mood disorders	9%	3.4x	2%	5.4x
MS & ALS	1%	2.6x	0%	5.5x
Neoplastic blood diseases and leukemia	2%	4.4x	0%	12.4x
Neurology	21%	2.8x	6%	3.7x
Poisoning and toxic drug effects	3%	5.8x	2%	3.6x
Renal Failures	8%	5.7x	1%	11.5x
Substance Abuse	5%	2.2x	3%	3.2x
Urology	7%	5.2x	2%	5.8x

[*] Clinical conditions as defined by Lewin's ERG grouper. 23 clinical conditions selected for presentation include common chronic conditions and conditions particularly prevalent among high-cost patients.
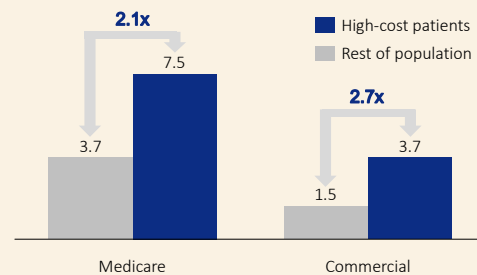
SOURCE: All-Payer Claims Database; HPC analysis

terized by multiple clinical conditions.[1,5] Among the Medicare and commercial populations in Massachusetts, high-cost patients had twice as many clinical conditions as the rest of the population (**Figure 4.2**).

Examining multiple conditions is important because the interactions among the conditions increase the complexity and cost of care.[6] In particular, patients with both behavioral health and additional medical conditions have health care needs that may require care from multiple providers within an often fragmented delivery system.

To better understand the interaction effects, we examined patients with both a behavioral health and at least one chronic medical condition. Among the Medicare and commercial populations, high-cost patients were twice as likely to have

Figure 4.2: Prevalence of multiple conditions among Medicare and commercial populations

Number of clinical conditions[*], 2010

Legend: High-cost patients / Rest of population

Medicare: 3.7 (Rest of population), 7.5 (High-cost patients), 2.1x
Commercial: 1.5 (Rest of population), 3.7 (High-cost patients), 2.7x

[*] Clinical conditions as defined by Lewin's ERG grouper. 23 clinical conditions selected to include common chronic conditions and conditions particularly prevalent among high-cost patients.

SOURCE: All-Payer Claims Database; HPC analysis

Figure 4.3: Average spending per patient based on behavioral health and chronic condition comorbidities

Claims-based medical expenditures (excludes pharmacy spending) relative to average patient with no behavioral health or chronic condition comorbidity in 2010
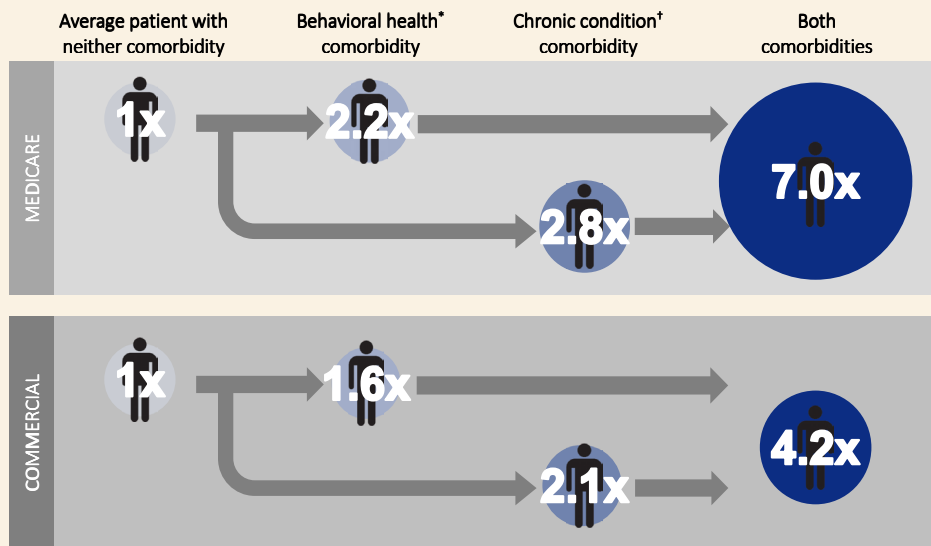
*Behavioral health comorbidity includes child psychology, severe and persistent mental illness, mental health, psychiatry, and substance abuse.

† Chronic condition includes arthritis, epilepsy, glaucoma, hemophilia, sickle-cell anemia, heart disease, HIV/AIDS, hyperlipidemia, hypertension, multiple sclerosis, renal, asthma, and diabetes.

SOURCE: All-Payer Claims Database; HPC analysis

Predictors of being high-cost and persistently high-cost patients

There were 13 clinical conditions that more than doubled the likelihood of being high-cost in the Medicare population, and 17 conditions that had this large of an effect in the commercial population (**Table 4.3**).[viii] These clinical conditions include some with relatively high prevalence rates, such as arthritis and cardiology, and others with low prevalence rates, such as leukemia and cancer.

Moreover, the presence of multiple conditions increased the likelihood of being high-cost even beyond the combined effects of the individual conditions. For example, the chances that a Medicare patient with both a behavioral health and a chronic medical condition was high-cost were 50 percent greater than would be predicted by the simple combination of the individual conditions.

a both a behavioral health and a chronic medical condition as the rest of the population. Comparing spending levels, the simultaneous presence of a behavioral health and a chronic medical condition was associated with an increase in spending beyond the simple combination of the two conditions' independent effects (**Figure 4.3**).[vi] This increase in spending indicates the enhanced complexity that occurs when dealing with multiple, interacting conditions.[vii,7]

While the effects were more muted, many of the same conditions that predicted a patient being high-cost in the current year also raised the likelihood that the patient would be high-cost in the next year.

Other than cancers and multiple sclerosis among the commercial population, no single clinical condition doubled the likelihood of being a persistently high-cost patient. However, combinations of conditions were powerful predictors of persistence. For example, for a commercial high-cost patient with three or more clinical conditions, the likelihood of being persistently high-cost was 1.4 times greater than would be expected based on a simple combination of the individual effects.

4.3.2 Region of residence

Location of high-cost and persistently high-cost patients

Descriptive analysis of concentration of high-cost patients by patient residence showed modest differences by region among both the Medicare and commercial popula-

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vi For example, among the Medicare population, a patient with only a behavioral health condition spent 2.2 times the average spending for a patient with no comorbidities, and a patient with only a chronic medical condition 2.8 times. The combination of these would suggest a 2.2 x 2.8 = 6.2 factor for increased spending for those with both types of conditions if there were no interactions among the conditions. Due to interactions, though, patients with both types of conditions had 7.0 times the average spending of patients with neither type of condition.

vii This claims-based analysis describes the impact on patients who have been identified and treated for both a behavioral health and a chronic medical condition. In addition, studies have shown that untreated behavioral health disorders lead to complications for physical health care issues and also result in higher spending. Moreover, individuals with serious behavioral health issues live, on average, 25 years less than individuals without behavioral health issues in part due to untreated medical physical medical conditions. The effect of the interacting conditions in these circumstances is not captured by our analysis.

viii Results control for age, sex, region of residence, income, other clinical conditions, and interactions among conditions.

Table 4.3: Effect of selected clinical conditions on the likelihood of being high-cost and persistent[*]

Odds ratio, 2010

Clinical conditions in 2010	High-cost in 2010		Persistent in 2011[†]	
	Medicare	Commercial	Medicare	Commercial
Arthritis	1.2x	2.5x	1.0x	1.2x
Asthma	1.3x	1.6x	1.3x	1.2x
Cardiology	1.7x	2.6x	1.1x	1.1x
Diabetes	1.2x	1.3x	1.2x	1.2x
Endocrinology	2.2x	2.3x	1.2x	1.2x
Hematology	2.1x	2.3x	1.4x	1.1x
Hepatology	1.6x	3.4x	1.1x	1.0x
High-cost cardiology	4.2x	7.3x	1.1x	1.3x
High-cost gastroenterology	2.1x	4.9x	1.0x	1.5x
High-cost pulmonary conditions	3.1x	5.4x	1.1x	1.3x
Hyperlipidemia	0.7x	0.8x	0.7x	0.8x
Hypertension	1.3x	1.8x	0.9x	1.0x
Infectious diseases	2.9x	4.4x	1.2x	1.6x
Malignant neoplasms (cancer)	2.1x	8.6x	1.2x	2.2x
Mental health	1.6x	1.8x	1.1x	1.2x
Mood disorders	2.3x	3.3x	1.1x	1.4x
MS & ALS	2.2x	4.0x	1.6x	3.1x
Neoplastic blood diseases and leukemia	4.2x	8.8x	1.8x	3.1x
Neurology	2.2x	2.4x	1.1x	1.3x
Poisoning and toxic drug effects	2.5x	2.6x	1.3x	1.3x
Renal Failures	2.7x	2.6x	1.8x	1.8x
Substance Abuse	1.2x	1.9x	1.2x	1.3x
Urology	1.6x	3.0x	1.0x	1.1x

[*] Clinical conditions as defined by Lewin's ERG grouper. 23 clinical conditions selected to include common chronic conditions and conditions particularly prevalent among high-cost patients.

[†] Of patients who were high-cost in 2010.

SOURCE: All-Payer Claims Database; HPC analysis

tions (**Figures 4.4, 4.5**).[ix,x] Regional patterns in concentration differ between the Medicare and commercial populations with one exception: Pioneer Valley/Franklin had a consistently low concentration of high-cost patients. Such differences may be due to patients' clinical characteristics (for example, condition prevalence), patients' social characteristics (for example, education), or health system characteristics (for example, high-price providers or practice variation). Similar regional patterns emerge for persistently high-cost patients (**Figures 4.6, 4.7**).

*Predictors of being high-cost and persistently high-cost patients*

In the predictive analysis, region of residence affected the likelihood of being high-cost.[xi] Among the Medicare population, Pioneer Valley/Franklin was the one region with a significantly lower likelihood of being high-cost (**Table 4.4**). Among the commercial population, patients residing in the Berkshires or on the Cape and Islands were more likely to be high-cost patients. Additional investigation is needed to determine if these regional patterns are

[ix] The maps showing regional concentration are adjusted for age and sex, but not clinical conditions.
[x] For further information on how regions were defined, see Technical Appendix B3: Regions of Massachusetts.

[xi] Pioneer Valley/Franklin was selected as the control region because the region has the lowest mean expenditures among the Medicare and commercial populations. Results control for clinical conditions, interactions among conditions, age, sex, and income.
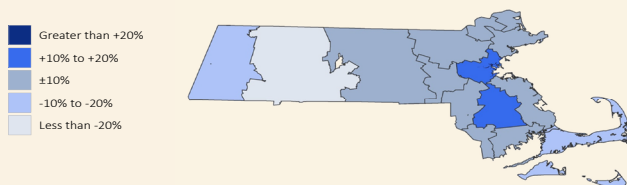
Figure 4.4: Concentration of commercial high-cost patients

Percent difference between region and statewide average, adjusted for age and sex
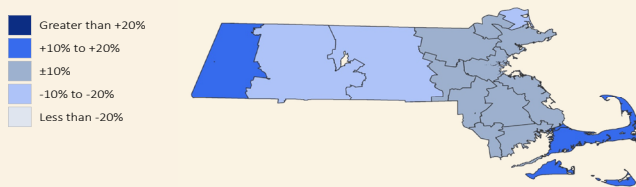

Figure 4.6: Concentration of commercial persistent high-cost patients

Percent difference between region and statewide average, adjusted for age and sex
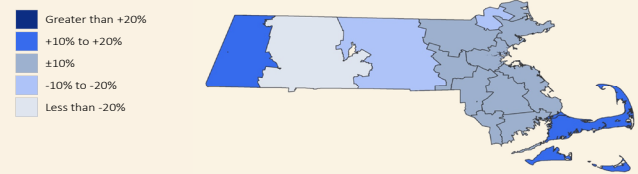
Figure 4.5: Concentration of Medicare high-cost patients

Percent difference between region and statewide average, adjusted for age and sex

Figure 4.7: Concentration of Medicare persistent high-cost patients

Percent difference between region and statewide average, adjusted for age and sex
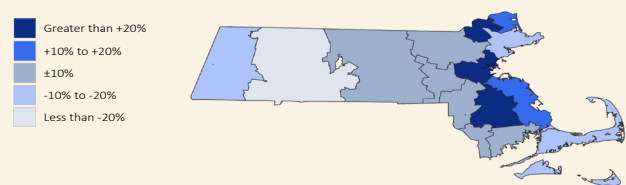
SOURCE: All-Payer Claims Database; HPC analysis

Table 4.4: Effect of patient residence on likelihood of being high-cost and persistent

Odds ratio relative to Pioneer Valley / Franklin

Region of residence*	High-cost in 2010		Persistent in 2011[†]	
	Medicare	Commercial	Medicare	Commercial
Berkshires	1.4x	1.6x	1.2x	1.1x
Cape and Islands	1.4x	1.6x	1.5x	1.2x
Central Massachusetts	1.3x	1.1x	1.4x	1.2x
East Merrimack	1.4x	1.2x	1.5x	1.2x
Fall River	1.2x	1.1x	1.5x	1.2x
Lower North Shore	1.2x	1.4x	1.4x	1.2x
Metro Boston	1.5x	1.3x	1.7x	1.2x
Metro South	1.5x	1.1x	1.6x	1.1x
Metro West	1.2x	1.2x	1.6x	1.2x
New Bedford	1.3x	1.1x	1.4x	1.1x
Norwood / Attleboro	1.4x	1.2x	1.6x	1.2x
Pioneer Valley / Franklin	1.0x	1.0x	1.0x	1.0x
South Shore	1.4x	1.2x	1.5x	1.1x
Upper North Shore	1.3x	1.1x	1.5x	1.2x
West Merrimack / Middlesex	1.3x	1.1x	1.5x	1.2x

* Regions as defined in Technical Appendix B3: Regions of Massachusetts
† Of patients who were high-cost in 2010.
SOURCE: All-Payer Claims Database; HPC analysis

driven by differences in health status (beyond the clinical conditions measured), provider mix, or other factors.

4.3.3 Demographic characteristics

Characteristics of high-cost and persistently high-cost patients

On average, high-cost commercial patients were eight years older than other commercial patients. A greater proportion of these patients were female. Among the Medicare population, the differences in age and sex were much less pronounced for high-cost patients. Age and sex did not differ materially between persistently and non-persistently high-cost patients for either payer type.

Income appeared to be a significant factor among the Medicare and commercial population, for which a relatively high concentration of high-cost and persistently high-cost patients lived in lower income communities (**Table 4.5**). Among the Medicare population, there was not a consistent pattern.

Table 4.5: Concentration of high-cost and persistently high-cost patients by income group

Percent difference from statewide average

Community income*	High-cost in 2010		Persistent in 2011[†]	
	Medicare	Commercial	Medicare	Commercial
Less than $35,000	3.4%	-0.7%	13.7%	0.6%
$35,000 to $50,000	9.5%	5.4%	21.6%	4.2%
$50,000 to $75,000	-0.6%	3.1%	-2.9%	4.2%
$75,000 to $100,000	-1.5%	-1.2%	-5.5%	-1.9%
Greater than $100,000	-7.2%	-7.0%	-12.9%	-7.8%

* Patient income is not directly available in the APCD. We used median household income in a patient's zip code of residence as a proxy for individual income.
[†] Of patients who were high-cost in 2010.
SOURCE: All-Payer Claims Database; HPC analysis

Predictors of being high-cost and persistently high-cost patients

The predictive analysis confirmed that among the commercial population, residing in a higher-income community was associated with a lower probability of being high-cost. No systematic relationship was found between community income and being a persistently high-cost

patient.[xii] Among the Medicare population, residing in a high-income (top-quartile) community did increase the relative probability both of high costs and persistence, although there was no consistent pattern across other income levels. Additional investigation is needed to determine if these income patterns are driven by differences in health status (beyond the clinical conditions measured), provider mix, or other factors.

4.4 Interventions

Many providers and payers are engaged in efforts to improve the efficiency of care delivery for high-cost patients. We reviewed three types of strategies for reducing expenditures for high-cost patients: preventive strategies, process and operations improvement, and care management.

4.4.1 Preventive strategies

Preventive strategies seek to reduce the incidence of conditions that drive expensive health crises, as many ED visits and inpatient hospitalizations among high-cost patients are avoidable.[8] The most common conditions tied to preventable hospitalizations for this population are congestive heart failure, bacterial pneumonia, chronic obstructive pulmonary disease, and long-term diabetes complication.[4] In dealing with these types of conditions among high-cost patients, prevention initiatives that have proven effective include targeted, intensive lifestyle intervention, comprehensive medication management, and health coaching.[9]

Lifestyle intervention programs focused on diabetes and hypertension have been developed and implemented by a number of organizations and payers.[10,11] Such lifestyle management strategies can avert the development of high-cost and life-threatening cardiovascular conditions.

Comprehensive medication management is another preventive strategy, where a patient's medications are individually and collectively assessed to ensure that the medications are appropriate, effective, safe, and able to be taken by the patient as intended.[12] Poor medication management is estimated to cause approximately 32 percent of all hospitalizations and is a key driver of preventable adverse events, adding an estimated more than $200 billion each year in avoidable hospital spending.[13,14] Improved medication management has significant potential to reduce the frequency of high-cost, acute exacerbations of be-

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[xii] Results control for clinical conditions, interactions among conditions, age, sex, and region of residence.

havioral health and chronic medical conditions.

Health coaching provides high-cost patients with the ability to understand their conditions and care plan, participate in shared decision-making with their providers, and take on more preventive, self-managed care. For patients, health coaching has led to significant improvement in functional status.[15]

4.4.2 Process and operations improvement

Preventive strategies may reduce, but not eliminate, the incidence of conditions that drive expenditures for high-cost patients. When an episode of care occurs, process and operations improvement aims to optimize the efficiency of the episode through sound operational practices and the adherence to evidence-based guidelines (for more information, see **Chapter 3).** For non-persistently high-cost patients, who often cannot be identified prospectively, the most promising interventions may be focused operational improvements that enhance the efficiency of care for the conditions most prevalent among this group.

One approach to improving efficiency is to standardize care for high-cost episodes. Standardization of inpatient care via checklists, more systematic applications of process engineering tools, and assuring consistent daily monitoring of ICU patients may reduce spending of high-cost episodes.[6] Some hospitals have adopted practices that enable structured reviews of process flows in order to reduce waste.[16] Alongside process standardization, the promotion and dispersion of information to support the practice of evidence-based medicine may improve quality and reduce costs (for more information, see **Chapter 2 and Chapter 3).[8]**

4.4.3 Care management

Care management and care coordination can reduce spending for high-cost and persistently high-cost. Uncoordinated care and social or environmental barriers to effective care lead to poor outcomes and spiraling costs for high-cost patients, many of whom require simultaneous treatment for multiple conditions.

Transitional care focuses on improving care transitions – such as when a patient is discharged from a hospital into a post-acute care setting – through better in-hospital planning and post–discharge follow-up. Such efforts target acute hospital and ED use and health status decline, emphasizing coordination and close clinical management among all involved parties.[17]

Care management activities can also play a role in better coordination of care for high-cost patients across multiple conditions. In CMS's Health Homes program, for example, provider organizations are responsible for better coordination of care for Medicaid beneficiaries with behavioral health and chronic medical conditions.[18]

In addition, other geographically targeted programs have focused on high-cost patients dealing with socio-economic challenges.[5] This strategy, popularly referred to as "hot-spotting," often targets patient populations with interventions that convene providers and community groups to solve problems in a more holistic manner.

4.5 Conclusion

High-cost patients have clearly identifiable characteristics and predictable factors. While some of the factors driving high-costs are clinical, others are socioeconomic, such as education, and delivery system-related, such as fragmented care or high-priced providers. As a group, the high-cost patients are not homogenous – for example, persistently and non-persistently high-cost patients have distinct characteristics. In addition to persistence, other meaningful characteristics can be used to target interventions for particular segments of high-cost patients. The interventions needed to capture these savings and health outcome opportunities require strategic investment and coordinated action from providers and payers, as well as support from community organizations and government agencies. As with all interventions, it will be important to evaluate the return on such investments and to ensure that a portion of savings are passed along from payers and providers to purchasers and consumers. Reducing expenditures by 10 percent across the high-cost Medicare and commercial patients in Massachusetts would represent nearly $1.8 billion in annual savings.

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