RESEARCH BRIEF

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Workers Compensation Burn Injuries—Catastrophic Claim Management—What's New

INTRODUCTION

The rising cost of healthcare in the United States may be considered as one of the top dilemmas for our nation. In recent years, the workers compensation (WC) industry recognized that medical costs now account for almost 60% of total claim costs and are outpacing indemnity costs.[1] Juxtaposed against this trend is the emergence of mega-loss claims from severe burn injuries, with medical costs exceeding many millions of dollars early in the claim's development. To gain insight into some of the contributing factors to the high medical costs associated with these burn-related mega-loss claims, the National Council on Compensation Insurance (NCCI) collaborated with Paradigm, an accountable care management organization focused on improving the lives of people with complex and catastrophic injuries and diagnoses. These two organizations highlight some of the key findings in this research brief.

KEY FINDINGS

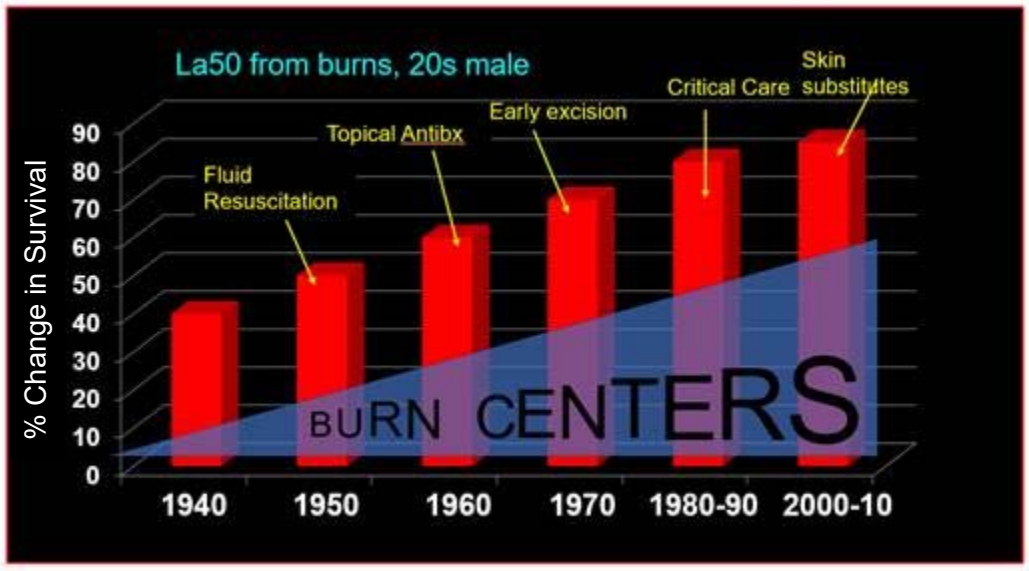
For severe burn injuries, Paradigm and NCCI data indicated:

- Few fatalities for injured workers occurred each year
- The survival rates for older injured workers improved
- A narrower group of occupations is observed in the majority of burn cases; injured workers with high severity burn claims tend to come from the manufacturing and contracting industries
- Acute inpatient hospital payments are a key cost driver for the treatment of severe burn injuries
- In recent years, the use of skin substitutes for burn treatment increased
- Many injured workers with high severities develop subsequent physiological and psychological problems
- Return to work is a common outcome, even for injured workers suffering severe burn injuries

IMPROVED BURN SURVIVAL

Over the last several decades, the survival rate for victims of severe burn injuries has steadily improved. Medical innovation, addressed later in this article, drove much of this improvement. Figure 1 provides a broad perspective of the positive trend across several decades and references the innovations introduced.

[1] Based on NCCI's financial data.

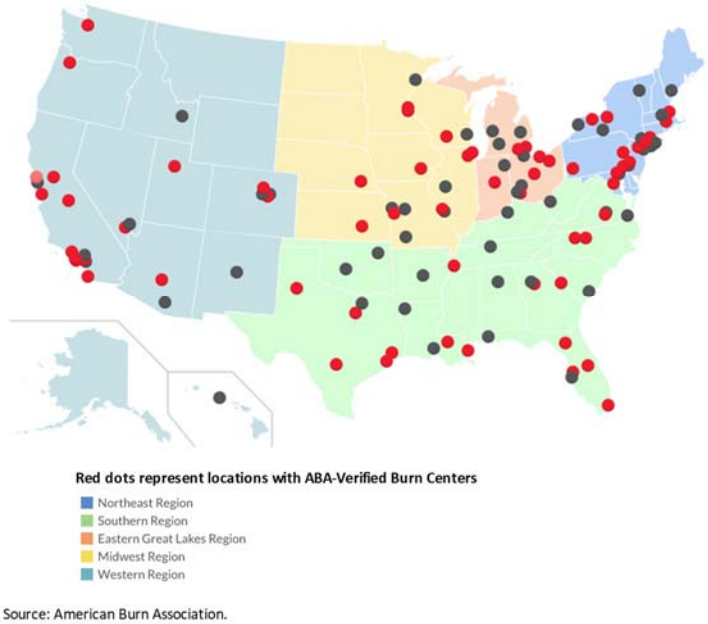


Source: Paradigm.

Figure 1

The Lethal Area 50 (LA50) index represents a 50% mortality for a given Total Body Surface Area (TBSA), allowing for another measure of the severity of a burn injury. Between 2010 and 2020, important innovations in treating burn injuries included genomic and immune modulation. It remains to be seen how these innovations and others yet to come may further improve survivability rates.

Specialized burn centers perform many of the medical innovations. Figure 2 displays the locations of burn centers in the United States as identified by the American Burn Association (ABA).



Source: American Burn Association.

Figure 2

Vast medical advances have transformed the approach to burn care in surgical critical care, fluid resuscitation methods, anti-infection medications, complex wound care, skin-substitute options, and nutritional and metabolic support resources.

In addition, the benefit of a multidisciplinary care approach in complex burn care resulted in shepherding severely burned victims into highly specialized, higher volume burn care centers across the nation. These factors contributed to improved burn care and burn survival in the United States.

One way to classify burn injuries is by analyzing the TBSA of the burn. The TBSA calculates the size of the burn injury, then uses this as a guide to determine the appropriate course of treatment. Higher TBSA corresponds to more serious burn injuries. A TBSA exceeding 20% classifies the burn injury as major. Figure 3 shows how the survival rate for burn injuries at age 30 has changed over time (i.e., between 1960 and 2017) for select TBSA ranges. All TBSA groups have seen an improvement in survival rates, and the largest survival gains have occurred for the most extensive burn injury groups.

Survival Comparison at Age 30

TBSA	Survival in 1960	Survival in 2017
<20%	>99%	>99%
20–40%	90%	93%
41–60%	60%	85%
>60%	20%	41%

Source: Paradigm.

Figure 3

For WC, less than 0.1% of all worker injuries result in a fatality [1]. Burn injuries are a fairly common cause of injury, with the majority of those claims resulting in minor, medical-only type of injuries. Much of our focus will be on the more severe burn injuries. We define “high severity” burn claims as those that exceed $500,000 in total incurred indemnity and medical amounts. The $500,000 threshold is consistent with NCCI’s threshold for large losses.

Figure 4 shows the countrywide [2] average fatality rates, along with the number of injured workers with high severity burn injuries, for Accident Years (AYs) 2011 through 2018. Countrywide, the number of injured workers with high severity burn injuries resulting in a fatality ranges from 4% to 11% per year across recent accident years. Although there is a small number of data points, Figure 4 shows that the workers suffering the most severe burn injuries have a high survival rate.

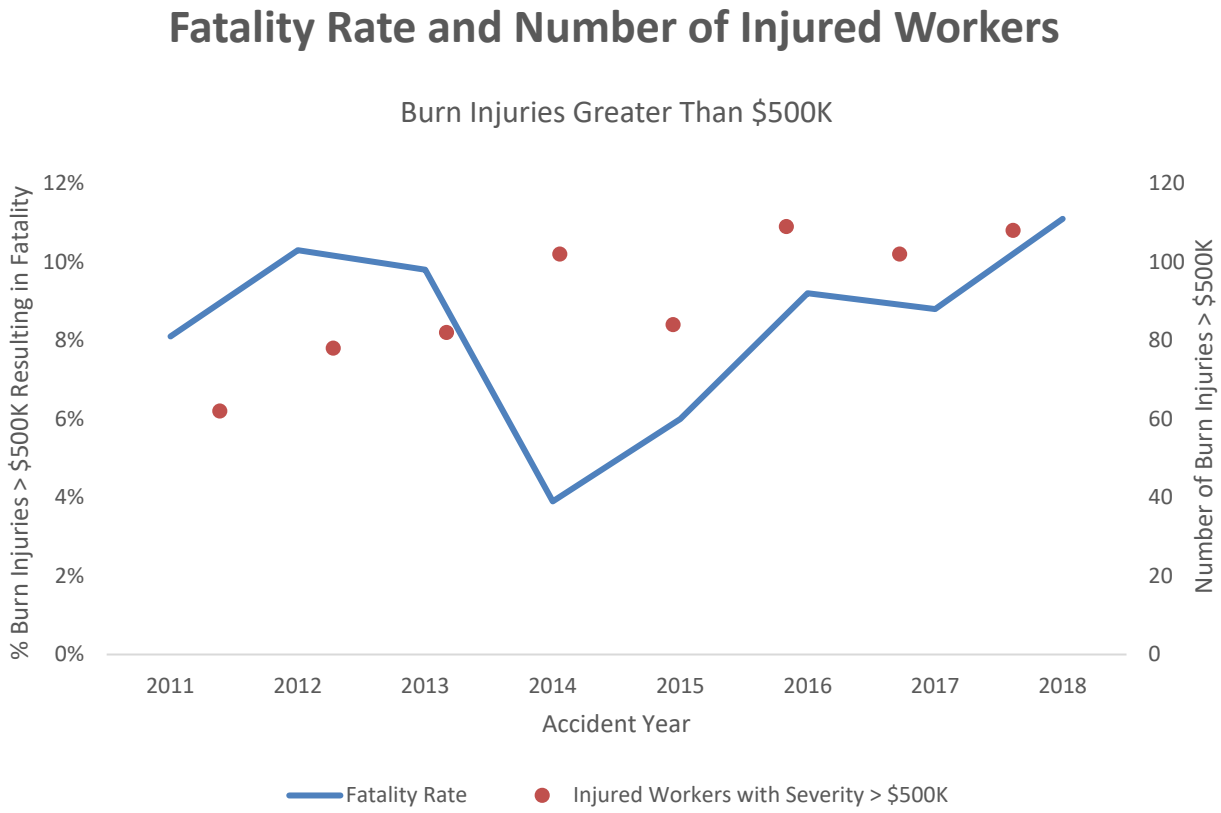


Figure 4

AGE FACTOR

An existing burn survival study shows mortality rates having a bimodal age distribution with peaks in mortality rates on both ends of the age spectrum involving younger ages (i.e., < 4) and older ages (i.e. > 60) [3]. Over the past three decades, burn survival improved across ages 20–80 in the United States, but those aged 60–80 had the greatest incremental gain. Paradigm's severe burn injury population's age distribution is consistent with the current working age demographics and has benefited from improved survival rates. For example:

- 75% of burn injuries are associated with workers aged 20–50
- 19% are associated with workers aged 51–60
- Workers aged 61–70 account for the remaining 6% of the burn-related claims

This is reflective of the recent trend of the aging workforce.

It is important to note that Paradigm's burn population includes injured workers having a high rate of premorbid conditions. In fact, 89% of them having at least one comorbid medical condition, and 61% having two or more comorbidities on the date of injury.

Age Distribution of Claims

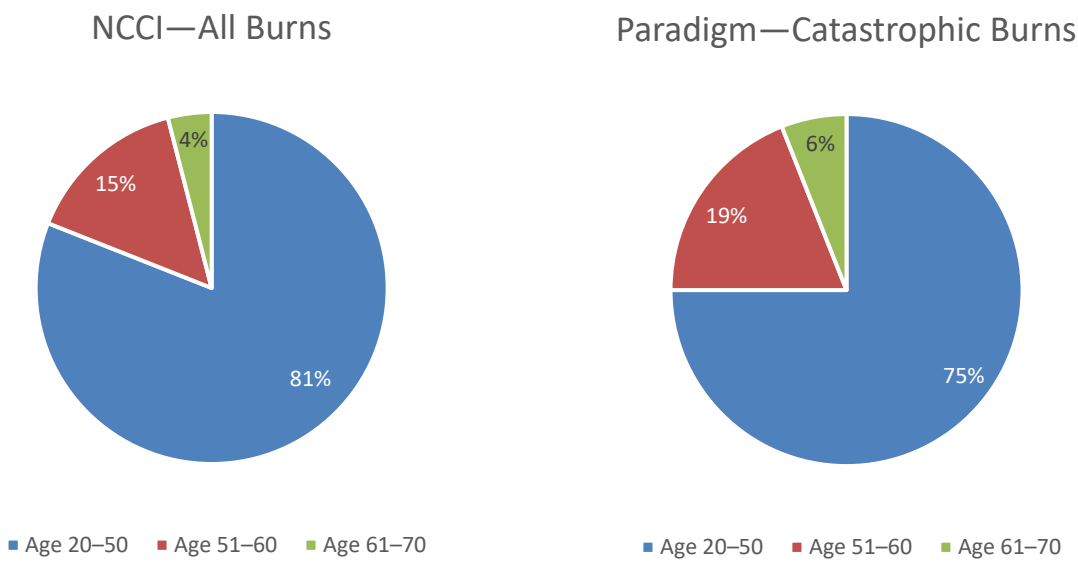


Figure 5

Analyzing NCCI data, Figure 5 shows younger workers consistently account for a higher proportion of all burn injuries—especially those who are 24 and younger. These workers are often employed in the restaurant industry, and the severity of these injuries is typically minor.

In AY 2018, injured workers between 25 and 44 years old comprised 51% of high severity burn injuries. Previous NCCI research [4] has shown that older workers comprise a larger portion of the US workforce. The research also indicates that the severity of claims for older workers is relatively higher than that for younger workers, and that the frequency of workplace incidents is increasing only for older workers.

The improved survival rate of burn claims from older age groups, in tandem with an aging workforce, has the potential to exert upward pressure on overall claim costs. For example, 24% of burn fatalities come from injured workers between the ages of 55 and 64 when combining NCCI data from AYs 2011 through 2018.

BURN TYPES AND INDUSTRY CATEGORIES

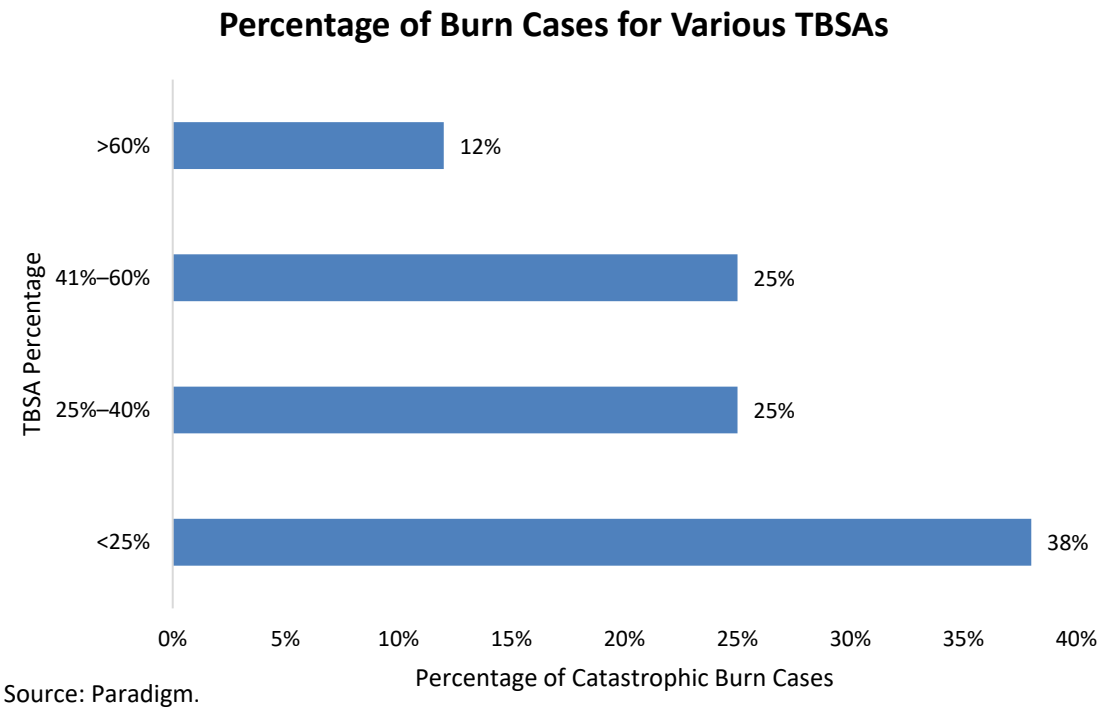
Thermal injuries from flames and scalds are the most common cause of burn injuries. In general, a burn condition is considered major when the skin injury involves 20% or more of the TBSA, excluding first-degree or epidermal burns. Lower-percentage TBSA burns are deemed severe, especially when complicated by inhalation injury, chemical burns, high-voltage electrical burns, or major trauma. As shown in Figure 6, Paradigm's burn injury analysis of its most recent 15-year data reveals:

- 50% of severe burn cases involve TBSA percentages between 25% and 60%
- 12% of injured workers had TBSA percentages above 60%

Additionally, some commonly observed burn injuries of Paradigm patients include:

- One-third had associated inhalation injuries
- 12% had high-voltage electrocution injuries
- 5% involved limb amputations

The majority of cases involved challenging body areas—such as the face, head, neck, and hands—requiring more intricate reconstructive surgical interventions.



Source: Paradigm.

Figure 6

As to occupational risk, Paradigm's data indicated more than 70% of the severe burn claims resulted from the following four sectors, provided in declining order of respective shares: manufacturing, construction, services, and transportation.

The occupations that lead to catastrophic burn injuries are significantly different than the occupations that lead to any general burn injury. NCCI data shows that more than 80% of injured workers who suffer burn injuries are found in classifications concentrated in two industry groups: goods and services, and manufacturing. Injured workers in restaurant-related occupations make up more than 30% of all burn injuries, with almost half of these injured workers incurring less than $500 in medical payments—only occasionally resulting in high severity injuries.

On the other hand, 60% of injured workers incurring high severity burn injuries are concentrated in the manufacturing and contracting industry groups. For NCCI states, Figure 7 shows the top five most frequently occurring occupations where an injured worker suffers a high severity burn injury.

Top 5 Class Codes—Percentage of All NCCI Burn Claims with Severity > $500K

Trucking (Class Code 7219)	5%
Electrical wiring (Class Code 5190)	3%
Electric light or power line construction and drivers (Class Code 7538)	3%
Restaurants (Class Code 9082)	2%
Chemical manufacturing (Class Code 4829)	2%

Figure 7

ACUTE HOSPITAL LENGTH OF STAY

When injured workers require hospitalization for more than 24 hours, these individuals receive care in an inpatient hospital setting. One of the primary drivers of the high financial burden associated with burn claims is the medical costs associated with acute inpatient hospital stays. Inpatient hospital services for injured workers accounted for 15% of total medical payments for all NCCI states in AY 2018. Between AYs 2011 and 2018, within the first year of the accident, payments for hospital inpatient services ranged, on average, between 38% and 44% of total medical payments for workers injured due to a burn. And it has generally increased from year to year. This percentage was even higher for injured workers with high severities, as shown in Figure 8.

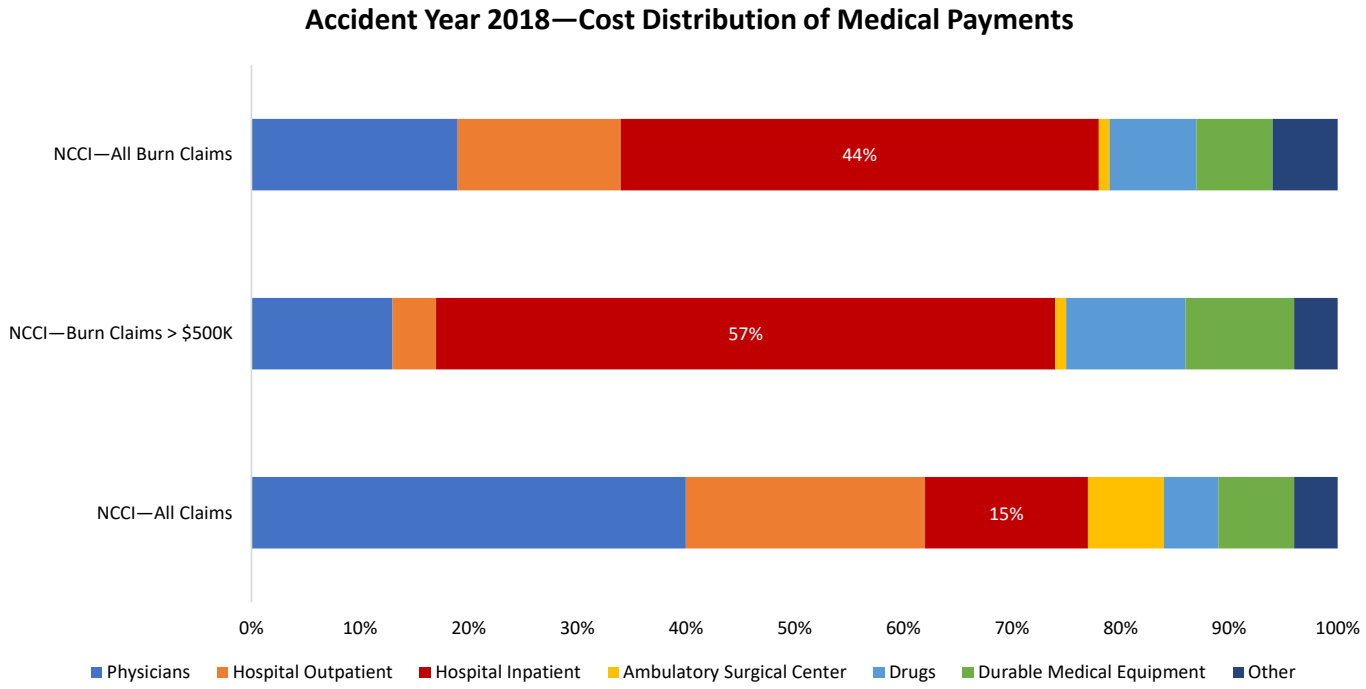


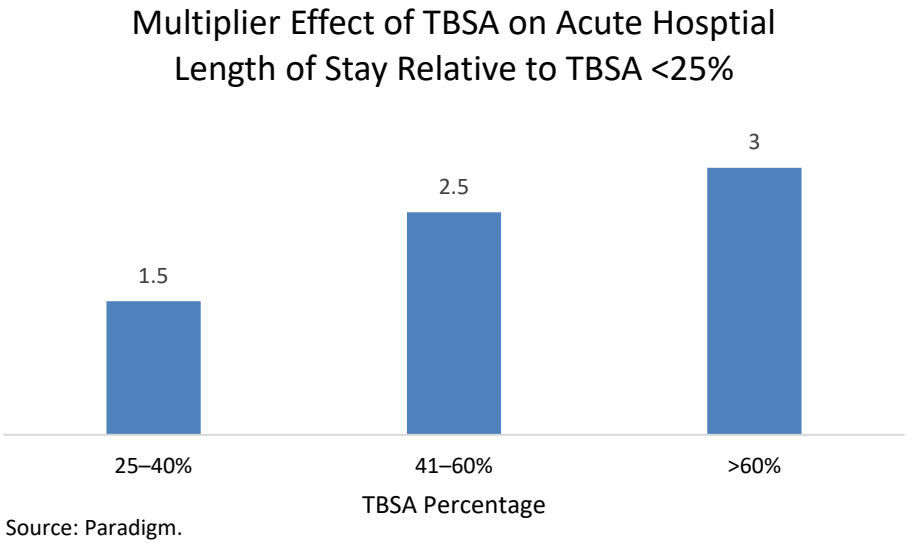
Figure 8

Hospital stays illustrate one key characteristic in how costs to treat an injured worker suffering a burn injury can differ significantly from the costs for treating injured workers caused by other types of injuries. Consistently from year to year, more than half of all injured workers suffering burn injuries require less than $550 in medical payments. However, treatment for one injured worker with a high severity burn injury may result in more than $10 million in medical payments. For example, analysis of NCCI's data over an eight-year period reveals that there have been three workers compensation claims with total incurred indemnity and medical amounts that exceed $15 million. The hospital inpatient portion of total medical payments grew steadily in recent accident years for injured workers having a burn injury.

The acute hospital cost is a function of the length of stay (LOS) in the inpatient hospital setting, as well as the level of intensity of care (incorporating advanced medical treatments). Studies on major burn injury populations show survivors to have experienced much longer hospitalization lengths of stay that correlate with the age, TBSA, and inhalation injury. Nonsurvivors equate to a shorter LOS and lower overall costs when compared with survivors [5]. Paradigm's burn population data validates the complexities associated with the interactions of the aforementioned factors on hospital LOS, where TBSA was the major determinant of early survival outcomes, followed by age factor, with inhalation injury greatly influencing both the LOS and acute inpatient hospital-related medical costs.

Figure 9 illustrates Paradigm's burn LOS data and demonstrates the TBSA multiplier effect on the average acute hospital LOS. The TBSA groups of 25-40%, 40-60%, and > 60% had 1.5, 2, and 3 times the LOS typically associated with TBSA percentages of < 25%, respectively. Furthermore, for Paradigm data between 2006 and 2019 for catastrophic burn injuries, costs for the acute inpatient hospital facility accounted for approximately 63% of the total medical costs paid during the

first two years for burn claims. This percentage in Paradigm's data is slightly higher than the inpatient hospital percentage of total payments observed in the NCCI data for high severity burn claims.



Source: Paradigm.

Figure 9

MEDICAL INNOVATIONS

Medical innovations is another category contributing to hospital lengths of stay and higher medical costs associated with burn claims. From a burn management perspective, the advent of skin substitutes from biologic or biosynthetic materials was regarded as a "game changer" to burn care and survival. They are said to provide faster temporary and permanent coverage of burned body surfaces. A number of skin substitutes are available, with brand names such as INTEGRA®, AlloDerm®, PriMatrix®, GraftJacket™, Dermagraft®, and Apligraf®. These skin substitutes may be used to complement the other skin graft options, categorized by their composition as well as source of material, such as allografts, xenografts, and autografts (including cultured epidermal autografts). The costs associated with these skin innovations can range from $2K to $57K per square foot. Although these medical innovations allow for expedient skin coverage of burned skin areas to facilitate burn recovery, their availability has fostered and promoted multiple surgical procedures involving skin wound debridement and skin grafting procedures. Hence, Paradigm data shows a steady increase in the average number of skin graft-related procedures, with the highest incremental growth seen with skin substitute utilization by nearly three-fold in the past decade.

NCCI data and analysis can help evaluate the cost drivers for treating injured workers in the workers compensation system. Historically, split-thickness autografts comprised the largest proportion of costs for skin grafts. However, beginning in AY 2015, skin substitutes gained a larger share of payments for skin grafts. For injured workers with high severities, skin substitutes accounted for a larger proportion of skin graft costs, compared to split-thickness autografts for three of the latest four accident years. As new skin graft technology emerges and is applied, this has the potential to increase overall costs to treat injured workers with burn injuries.

Another emerging technology rapidly being incorporated into contemporary burn management practice is the use of laser therapy for hypertrophic scar and keloid management. A variety of therapies utilized to treat burn-associated scars include physical therapy, compression garments, topical silicone gel, cryotherapy, topical or injected steroids, a host of topical ointments containing moisturizers, antipruritics, vitamins, and inflammatory modulators without consistent efficacy. The recent addition of laser therapy as a treatment option for scars has increased the number of options for mature scars, even years after the burn injury. As a result, Paradigm is seeing more liberal use of lasers in the post-burn care period. This has been demonstrated by the rapidly increasing percentage and frequency of laser treatments associated with burn claims over the past seven years. This increases the medical costs associated with burn care.

LONG-TERM BURN INJURY AND ASSOCIATED CHRONIC HEALTH CONDITIONS

Catastrophic burn injuries have prolonged impacts on the injured workers' long-term health, physiologically and psychologically. In Figure 10, Paradigm's clinical database shows that, even at the two-year post-injury period, there is a high prevalence of medical challenges that require ongoing long-term medical management related to disfigurement, hypertrophic scarring, and temperature hypersensitivity—along with depression, altered self-image, chronic pain, and post-traumatic stress syndrome. These conditions require ongoing medical and rehabilitation care, which will ultimately add to the financial impacts associated with burn injuries.

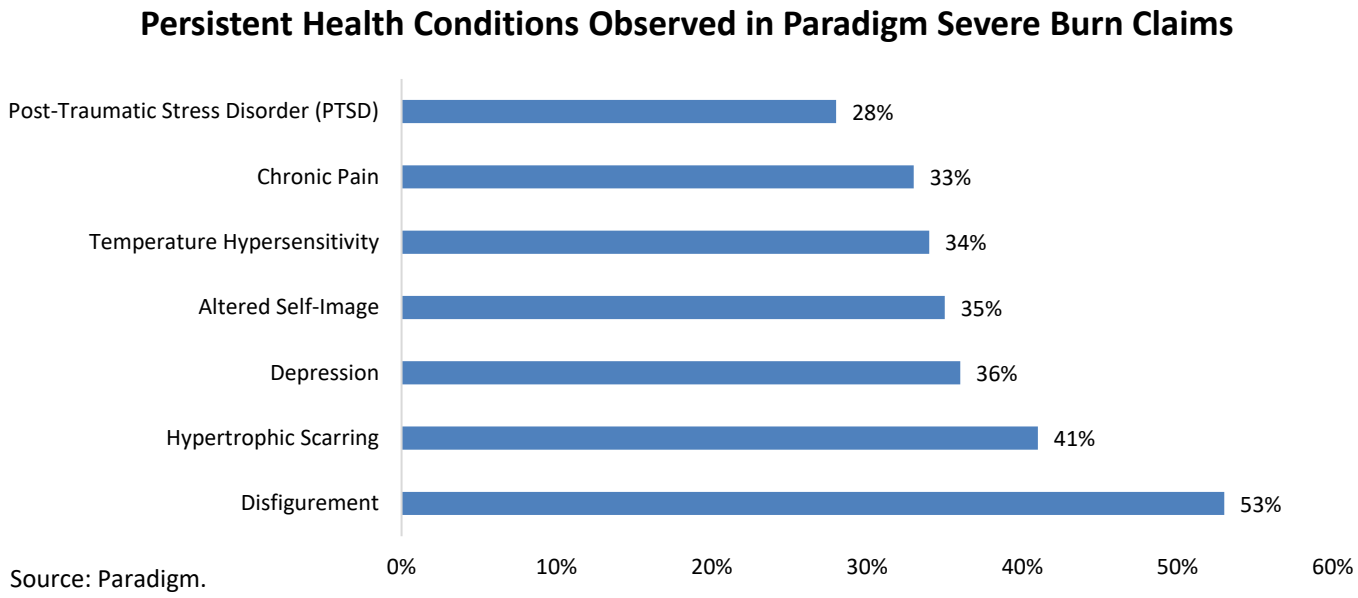


Figure 10

FUNCTIONAL OUTCOMES

Despite the higher medical cost consequences associated with evolving medical innovations and care challenges associated with major burn injuries, Paradigm's data also indicates what is functionally attainable by severe burn injury survivors. Within two years, nearly 80% of injured workers with severe burns obtain approval from the treating physician to be released to return to work. Return to work typically signifies the injured worker has achieved maximum medical improvement, a major milestone in treating injured workers and determining ultimate costs. The key takeaway is that our WC industry has the capacity, capability, and commitment to help severely injured workers regain their livelihood, even after experiencing a catastrophic burn injury.

ABOUT THE AUTHORS

Victor Wong joined NCCI in 2010 and works in the actuarial research area. He is an Associate of the Casualty Actuarial Society and a Member of the American Academy of Actuaries.

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ABOUT PARADIGM

Paradigm is an accountable care management organization focused on improving the lives of people with complex and catastrophic injuries and diagnoses. The company has been a pioneer in value-based care since 1991, offering deep clinical expertise, high-value specialty networks, behavioral health support, payment integrity solutions, and robust data analytics to generate the very best outcomes for patients, payers, and providers.

Paradigm is headquartered in Walnut Creek, California, with offices across the U.S. For more information, please visit www.paradigmcorp.com.

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