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Examining the high users of hospital resources: implications of a profile developed from Australian health insurance claims data

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Abstract

Objective To develop and examine a profile of the demographic, hospital admission and clinical characteristics of high users of hospital resources within a cohort of privately insured Australians.Methods Hospital admissions claims data from a group of private health insurance funds were analysed. The top 1% of hospital users were selected based on three measures of resource utilisation: number of admissions, total bed days and total insurance benefits paid. The demographic, hospital admission and clinical characteristics data were compared for these three measures of resource utilisation.Results Compared with the general insured population, the three high-use cohorts are older, have more public hospital admissions and have more same-day admissions. The three high-use cohorts have the same top five principal diagnosis categories. These five categories account for more than two-thirds of admissions. The top 1% of users is responsible for a large proportion of total resource utilisation, accounting for 13% of total costs and 21% of total bed days.Conclusions The highest users of hospital resources have a distinct profile, accounting for a large proportion of total resource utilisation for a narrow range of health conditions. The age and hospital admission profile of this group suggest both policy and service considerations for the targeting of interventions to support this high-needs group.What is known about this topic? Statistics are regularly published on the uptake and use of private health insurance in Australia but there is little detailed information on resource utilisation in specific subgroups, particularly those with the highest levels of hospitalisation.What does this paper add? This paper provides a profile of high resource utilisation among a privately insured cohort, describing demographic, hospital admission and clinical characteristics across three measures of resource utilisation. Patterns of use are detailed in this profile, for example the top 1% of users have a higher proportion of public hospital admissions as a private patient. The clinical profile of admissions was similar for the three measures of resource utilisation and there was considerable overlap in the individuals categorised in each high-use group.What are the implications for practitioners? The narrow demographic and clinical profile of the high resource utilisation groups shows a chronic disease burden that is different to the focus of current chronic disease policy measures. The high-use conditions identified in this study are less amenable to preventive measures and new strategies may be required to target this high-needs group.

Keywords

Publication Details

Examining the high users of hospital resources: implications of a profile developed from Australian health insurance claims data

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Abstract

Objective.   To develop and examine a profile of the demographic, hospital admission and clinical characteristics of high users of hospital resources within a cohort of privately insured Australians.

Methods.   Hospital admissions claims data from a group of private health insurance funds were analysed. The top 1% of hospital users were selected based on three measures of resource utilisation: number of admissions, total bed days and total insurance benefits paid. The demographic, hospital admission and clinical characteristics data were compared for these three measures of resource utilisation.

Results.   Compared with the general insured population, the three high-use cohorts are older, have more public hospital admissions and have more same-day admissions. The three high-use cohorts have the same top five principal diagnosis categories. These five categories account for more than two-thirds of admissions. The top 1% of users is responsible for a large proportion of total resource utilisation, accounting for 13% of total costs and 21% of total bed days.

Conclusions.   The highest users of hospital resources have a distinct profile, accounting for a large proportion of total resource utilisation for a narrow range of health conditions. The age and hospital admission profile of this group suggest both policy and service considerations for the targeting of interventions to support this high-needs group.

What is known about this topic?   Statistics are regularly published on the uptake and use of private health insurance in Australia but there is little detailed information on resource utilisation in specific subgroups, particularly those with the highest levels of hospitalisation.

What does this paper add?   This paper provides a profile of high resource utilisation among a privately insured cohort, describing demographic, hospital admission and clinical characteristics across three measures of resource utilisation. Patterns of use are detailed in this profile, for example the top 1% of users have a higher proportion of public hospital admissions as a private patient. The clinical profile of admissions was similar for the three measures of resource utilisation and there was considerable overlap in the individuals categorised in each high-use group.

What are the implications for practitioners?   The narrow demographic and clinical profile of the high resource utilisation groups shows a chronic disease burden that is different to the focus of current chronic disease policy measures. The high-use conditions identified in this study are less amenable to preventive measures and new strategies may be required to target this high-needs group.

Additional keywords: chronic disease, diagnosis, need, private.

Introduction

Health insurance arrangements in Australia are distinctive. Medicare is a universal, tax-financed insurance system that covers the whole population for certain health services. Private health insurance is voluntary but government policies subsidise the industry and encourage uptake, particularly among high-income

earners. Private health insurance can be used in both private and public hospitals and both supplements and duplicates Medicare for hospital care.[1,2] Initiatives of the Federal Government to reverse declining private health insurance membership in the late 1990s and early 2000s mean that people take out insurance for reasons unrelated to their health[3] and, as a result, may have perverse motivations to have higher levels of health service use.[4,5]

There is a wide body of research comparing health services utilisation of those with and without private health insurance in Australia. Those with private health insurance have been found to have higher levels of health service utilisation than those without private health insurance, particularly in relation to surgical procedures.[6,7] Studies have also looked at the usage of hospital services as a public or private patient for specific types of conditions, such as nervous, respiratory and circulatory conditions, although these studies have not focused on the use of private health insurance specifically.[8,9]

Although critiques of government policies that support the private health insurance industry are plentiful,[10–13] there has been surprisingly little research on the patterns of hospital utilisation associated with private health insurance, and none that looks at the characteristics associated with the highest use of hospital resources among the insured population. This is an important area of investigation because following the introduction of the *Private Health Insurance Act (2007)*, private health insurers have been able to offer a wider range of disease management and hospital substitution services with expected benefits of improved member health status and a reduction in hospitalisations and associated hospital claims.[14]

International research on disease management programs suggests that targeting those most at risk is an important implementation strategy to ensure that programs are most effective, from both a health outcomes and cost perspective.[15,16] Although private health insurers in Australia generally do not have detailed health and medical information on their members, they do have information on hospital admissions, used for the payment of insurance claims. Given this, investigation into the patterns of hospital resource utilisation among the insured population could inform disease management and other support strategies by identifying who has the highest level of resource utilisation and for what conditions people are seeking care.

To create a profile of the highest users of hospital resources within the insured population, this study selected three top-1% samples using three different measures of resource utilisation: number of admissions; total bed days; and total benefits paid. These three measures have been used in a range of studies in both

Australia and internationally to measure resource utilisation but are generally not used together.[8,17–19]

Methods

Data sources

This study used de-identified insurance claims data from 13 Australian private health insurance funds. The dataset covered a period of more than 5 years, with the earliest hospital discharge date being 1 September 2009 and the latest date being 2 June 2015. The dataset contained 1 387 173 admissions relating to 405 428 individuals.

The dataset included items at the level of member, hospital admission and claims. All original identifiers were removed from the variables before researcher access and replaced with encrypted identifiers to protect the privacy of individuals and organisations in the dataset. The variables used in the analysis were:

- Member information: member identifier, fund identifier, member year of birth, member sex
- Admission administrative information: admission identifier, date of admission, date of separation, hospital type, and same-day status
- Admission clinical information: diagnosis, code index (code index of 1 used to indicate principal diagnosis)
- Claims information: benefits paid (used to derive total member benefits paid)

The level of insurance cover of the members was not included so the exact effect, although not expected to be material, of different types of insurance policies on the services claimed is not known.

Cohort selection

From the full study population, three cohorts were identified as the top 1% of users based on resource utilisation defined either by total number of admissions, total bed days or total benefits paid. Table 1 provides further information on the method of calculation and selection criteria for each of the 'high-use' groups.

As 405 428 people had a hospital admission, a 1% sample is 4054 people. Due to the number of people that shared cut-off values for admissions and length of stay, the three cohort sizes vary slightly. The cohort sizes are included in Table 2.

Data limitations

A limitation of the dataset used for this analysis is the completeness of clinical information, particularly relating to public

Table 1.   Selection criteria for high-resource-utilisation cohorts

High-use cohort	Method of calculation	Selection criteria for inclusion
High admissions	Sum the total number of admissions per individual	Individuals with >28 admissions in the study period
High bed days	Calculate length of stay for each admission using admission and separation data.[A] Create total bed days for each individual by summing length of stay for each admission	Individuals with >98 bed days in the study period
High cost	Sum all benefits paid for each individual with a hospital admission	Individuals with total benefits paid > A$87 623 in the study period

[A]A hospital admission in which the admission and separation date occurred on the same day was allocated a length of stay of 1 day. This is consistent with methods used by the Australian Institute of Health and Welfare for hospital statistics.[24]

Table 2. Demographic and hospital admission characteristics of high-resource-utilisation cohorts and full study population

	Full study population	High-admission cohort	High-bed-days cohort	High-cost cohort
Demographic characteristics				
Cohort size	405 428	4225	4098	4055
Median age (mean)	56 years (51.3)	68 years (65.1)	72 years (67.9)	73 years (70.0)
Proportion aged 65 years and over	31.6%	59.5%	64.9%	72.3%
Proportion female	55.4%	57.6%	58.2%	49.8%
Hospital admission characteristics				
Number of hospital admissions	1 387 173	263 322	187 407	158 865
Number of hospital admissions used in clinical profile (% of total)[A]	1 109 154 (80.0%)	185 514 (70.5%)	116 800 (62.3%)	115 032 (72.4%)
Proportion public hospital	16.0%	20.5%	27.4%	24.0%
Proportion same-day admissions	60.4%	80.3%	70.7%	67.1%

[A]Public hospital information was excluded from the analysis of clinical information.

hospital admissions. Although the Hospital Casemix Protocol is the national standard for information provided from hospitals to both private health insurers and the Australian Government,[20] public hospitals do not have to provide the complete set of Hospital Casemix Protocol data to insurers. Xie and colleagues also noted this issue in a recent study using data obtained directly from another Australian private health insurance fund.[21] Although admission administrative information for public hospitals was complete, admission clinical information was only 48% complete. As a result, public hospital information was excluded from the analysis of clinical information.

Statistical analysis

After cohort selection, descriptive statistics were generated to profile the three high-use cohorts and the full study population. For demographic statistics, sex and age distribution of the cohorts were analysed. Hospital admissions were analysed by hospital type (public hospital, private hospital or private day hospital) and by same-day or overnight admission status.

Where the data were available, the principal diagnosis of each private hospital admission was investigated (principal diagnosis data were available for 95.9% of private admissions). The percentage of hospital admissions included in the clinical profile is detailed in Table 2.

The principal diagnosis for each admission was grouped according to the 21 International Statistical Classification of Diseases and Related Health Problems, Tenth Revision, Australian Modification (ICD-10-AM) chapters.[22] For all cohorts, chapter 21 ('Factors affecting health status and contact with health services') had the highest proportion of admissions. Due to the heterogeneous nature of this ICD-10-AM chapter, specific ICD-10-AM codes for principal diagnosis for this chapter were investigated. It was found that three ICD-10-AM codes (Z509: care involving use of rehabilitation procedure, unspecified, Z511: pharmacotherapy session for neoplasm, and Z491: extracorporeal dialysis) made up the majority of chapter 21 items (more than 90% for the three high-use cohorts). Although these codes do not represent specific health conditions, there are circumstances in which the Australian coding standards require specific therapies or interventions to be coded as the principal diagnosis, rather than a health condition.[23] The coding of these

three items represents three such circumstances. These three codes were treated as their own diagnosis grouping in the clinical profile analysis due to the large proportion of admissions in which they were listed as the principal diagnosis.

The resource utilisation for each high-use cohort was then compared with that of the full study population. Finally, overlap in individual membership of the cohorts was investigated by identifying the common member identifiers that appeared in each high-use cohort. All statistical analysis was performed using R version 3.2.2 (The R Foundation, Vienna, Austria).

Ethics

This study received ethics approval from the University of Wollongong and Illawarra Shoalhaven Local Health District Health and Medical Human Research Ethics Committee on 12 July 2016 (No: HE16/211).

Results

Demographic and hospital admission profile of high-use cohorts

Table 2 summarises key demographic and hospital admission characteristics of each of the three high-use cohorts and the full study population. As may be expected, the high-use cohorts are older than the full study population with approximately double the proportion of individuals aged 65 years and over (high-use cohorts ranged from 60% – 72% of members aged 65 years and over compared with 32% for the full study population). The high-cost cohort has the highest proportion of individuals aged 65 years and over at 72%. There are a greater proportion of females in all high-use groups, apart from the high-cost group.

Each of the high-use cohorts has a higher proportion of admissions to public hospitals compared with the full study population (16% of all admissions). For the bed days and high-cost cohorts, public hospital admissions as a proportion of total hospital admissions represent about one-quarter of all admissions (27% and 24% respectively). The proportion of same-day admissions for the high-use cohorts is higher than the total study population. The highest proportion of same-day admissions is for the high-admission cohort, with 80.3% of their admissions being same-day.

Clinical profile of high-use cohorts

Figure 1 shows the top five principal diagnosis categories for hospital admissions to a private facility for each of the high-use groups and the total study population where data were available.

The same five categories account for the top principal diagnoses for admissions in all high use cohorts – mental health, dialysis, rehabilitation, pharmacotherapy and neoplasms. With the exception of mental health and dialysis, the same principal diagnosis categories are also represented in the top five categories for the total population dataset. Mental-health-related conditions account for the highest proportion of admissions in all high-use cohorts, but if the categories of pharmacotherapy and neoplasms are combined then cancer-related diagnoses are responsible for the highest proportion of admissions for the high-admission and high-cost cohorts.

Although there are 21 ICD-10-AM chapters, the top five principal diagnosis categories, from only three chapters, make up a remarkably high proportion of all admissions in the high-use cohorts – 67.8% for high-cost, 74.4% for high-admission and 78.1% for high-bed-days.

The contribution of high-use cohorts to overall resource utilisation

The high-use cohorts represent the top 1% of individuals using the most resources however measured, but they account for much more than 1% of total resource utilisation. The highest proportion overall is for bed days, with the high-bed-days cohort representing 21.2% of total bed days. The high-admission cohort

represents 19.0% of total admissions and the high-cost cohort represents 13.3% of total costs.

*The relationship between the three measures of high resource utilisation*

Figure 2 depicts the relationship between each of the three high-use cohorts and the degree of overlapping membership of the three cohorts. The figure demonstrates a high degree of variation in resource utilisation even within the top 1% cohorts. The 13% of individuals that are represented in all three high-use cohorts have an average number of hospital admissions 10 times the number of those that are only represented in the high-cost or high-bed-days cohorts. Similarly, the average bed days of this subgroup are four times the number of those only represented in the high-admission and high-cost cohorts. There is greater overlap in membership of the high-cost and high-bed-days cohorts than the high-admission cohort.

Discussion

This study examines the demographic, hospital admission and clinical characteristics associated with the highest levels of hospital resource utilisation among a privately insured cohort. Although many studies have examined differences in demographic and hospitalisation characteristics between those with and without private health insurance in Australia, the differences within the privately insured population has not been explored in detail. As might be expected, those with the highest levels of hospital resource utilisation are, on average, older than the general
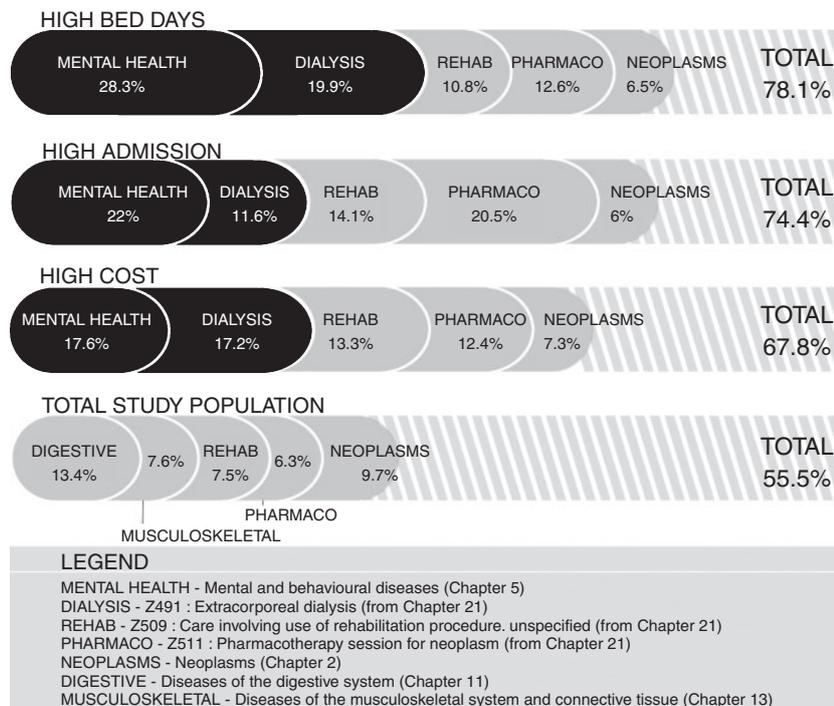
Fig. 1.   Top five principal diagnosis categories for each high-resource-utilisation cohort and total study population for private hospital admissions based on International Statistical Classification of Diseases and Related Health Problems, Tenth Revision, Australian Modification chapters.[22]
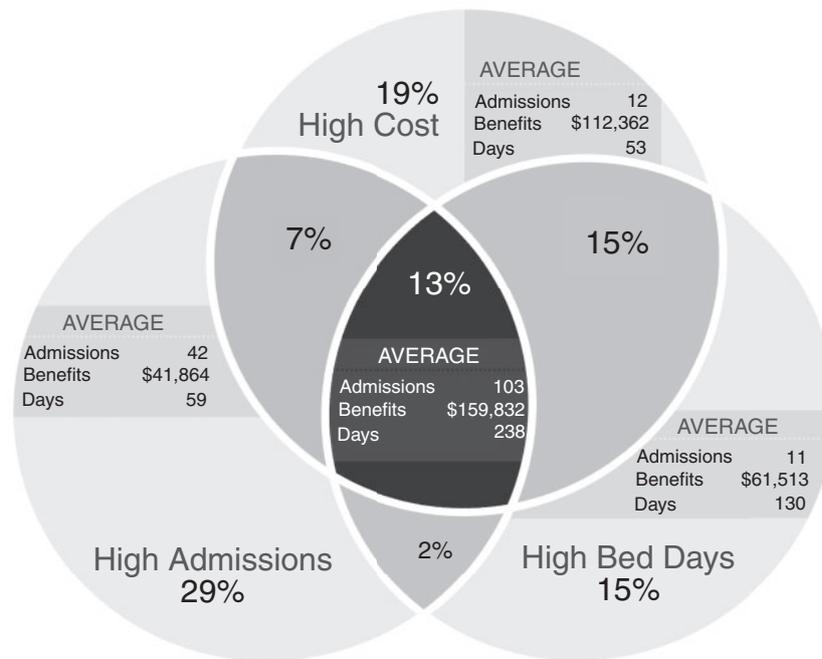
Fig. 2. Individuals in each high-resource-utilisation cohort (or cohorts) as a proportion of the total number of individuals in the three high-resource-utilisation cohorts (mean admissions, benefits (A$) and bed days for specific subgroups included).

insured population. They also have a higher rate of public hospital admissions and a higher rate of same-day admissions.

The higher rate of public hospital admissions may be influenced by several factors including: a higher rate of admission via emergency department presentations (which are concentrated in public hospitals); previous selection of private health insurance in a public hospital making it more likely that the payment category is selected on a subsequent admission; or the location in which services are provided, such as rural and regional areas that have fewer private hospitals.

The profile reported in the present study complements national hospitalisation statistics that analyse the reason for admissions to public and private hospitals[24] by focusing on the top 1% of hospital users with private health insurance and the conditions that users are seeking treatment for in the private sector. The findings of this study are relevant to policy reform of the private health insurance industry that is being actively considered by the Private Health Ministerial Advisory Committee, established in 2016 to provide the Federal Government with advice on private health insurance reforms.[25]

A notable finding is that the proportion of same-day admissions for each of the high-use cohorts is higher than the rate for the full study population. Although this in part reflects the frequency with which some services need to be delivered (for example, dialysis several times per week), it also reflects the high proportion of people requiring frequent, but usually time-limited, services, such as mental health programs, rehabilitation and chemotherapy. Although the clinical profile was only based on admissions to private hospitals, which have higher rates of surgical procedures,[6,24] these top categories represent conditions requiring primarily non-surgical interventions.

Despite some differences in the demographic and admission characteristics of the three high-use cohorts, the same top five principal diagnosis categories were found for each group and in each case they account for more than two-thirds of hospital admissions. Few studies have compared the three measures of hospital resource utilisation used in the present study. Similar to the present study but for a different outcome of interest, a recent study by Cheng and colleagues also found that using different hospital resource utilisation measures – admissions numbers, bed days and costs – produced similar results in relation to public and private hospital utilisation for heart disease patients.[8] The degree of cohort membership overlap between the different high-resource-utilisation cohorts may explain the similar results between resource utilisation measures.

The study results suggest that the highest users of hospital resources have a distinct profile. The most resources are being used for a narrow range of health conditions and use is highly concentrated within a small group of fund members accounting for a large proportion of total resource utilisation. These results are similar to an examination of a Victorian public health organisation in which it was found that 20% of costs are spent by 3% of the population.[26]

There is a strong focus within the Australian health sector at present on reducing potentially preventable hospital admissions and moving care for chronic conditions outside of hospitals to the community.[27] Although the results of both insurer- and government-funded chronic disease management programs in Australia have been mixed,[28–30] the findings of the present study indicate that the heaviest users of hospital services are seeking services for a narrow range of conditions that are not the target of traditional disease management programs. The major reasons for

hospitalisation – including chemotherapy, dialysis and most rehabilitation – in the top 1% of privately insured hospital users are not preventable.

Furthermore, the majority of hospital admissions are on a same-day basis, which raises questions as to how, and if, admissions could be further reduced or made more efficient. Although only a narrow set of health conditions account for the majority of hospital admissions among high-resource-utilisation groups, these conditions relate to a diverse set of care needs, so different strategies will likely be required. This is similar to the conclusion drawn by Wodchis and colleagues in a recent study of high health costs in Canada.[17]

The present study used insurance claims data from a group of private health insurance funds so was not able to investigate hospital admissions for the cohort as a public patient or paid by another party, such as third-party compensation schemes. This is an area for future research. The private health insurance funds that contributed data to this study only represent ~10% of the private health insurance market, so it needs to be considered whether results are representative of the wider Australian private health insurance industry. However, the age profile of the study population is similar to publicly available statistics published by the regulator of the private health insurance industry.[31]

Another limitation of this study relates to the completeness of clinical information as outlined earlier. It is worth noting that the insurance claims data used for this study is the main source of data available to private health insurance funds for the purposes of understanding and targeting health interventions towards their members. The fact that a substantial proportion of this data has missing diagnosis and clinical information is a concern, particularly as many insurers seek to increase disease management services.

Conclusion

Through examination of the highest users of healthcare resources, this study found that private health insurance claims for hospital admissions are concentrated to a small number of users who are seeking care for a narrow range of conditions. In contrast to most hospital-admission-reduction strategies that focus on chronic diseases such as heart disease and diabetes, the high-use conditions identified in this study are not easily preventable through disease management interventions that focus on self-management. In many cases, treatments for these conditions already have a level of efficiency being provided as same-day admissions. Further research could build on the findings of this study by investigating the incidence of comorbidity of conditions among the top hospital users and examining specific conditions, such as the detailed patterns of service use for mental health patients, where there are differences in the classification of hospital episodes between public and private sectors.

Competing interests

The authors declare there are no competing interests.

Acknowledgements

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