Evaluating Pressure Ulcer Occurrence in Long-Term Care: Pitfalls in Interpreting Administrative Data

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ABSTRACT. Administrative databases for long-term care frequently collect information on fixed dates of the calendar year, rather than for entire episodes of care. Patients discharged or dying prior to an evaluation date are lost to follow-up. We used one such database, the VA Patient Assessment File, to examine pressure ulcer occurrence in long-term care. Clinical studies have established that most pressure ulcers develop during the first several weeks following admission. In these data, however, pressure ulcer development was less common in patients assessed within 2 months following admission, as compared to those examined at 3 to 6 months. This finding appears to be related to the selective discharge of patients, which makes these patient populations noncomparable. These results highlight that care must be exercised when interpreting results obtained from such administrative data. J Clin Epidemiol 49;3:289–292, 1996.

KEY WORDS. Decubitus ulcer, outcome assessment, nursing homes, long-term care

The use of large administrative databases is central to the “outcomes movement” [1]. Such data have been used with great effect in studying outcomes of acute hospital care, including mortality for common medical conditions such as myocardial infarction and pneumonia [2], and surgical procedures such as coronary artery bypass grafting [3] and transurethral resection of the prostate [4]. While administrative databases have been proposed for studying the effectiveness of long-term care [5,6], they have been little used in this setting. Studies of hospital care typically use data relating to the hospital stay, a well-defined event with admission and discharge dates. Administrative databases for long-term care, where patients may be institutionalized for years, may not have a well-defined event to study. Rather, they contain information collected on prespecified dates when all patients residing in a facility are evaluated. Information on patients discharged or dying prior to the evaluation date is thus missing, and cases that remain may not be representative of the whole population. In this study, we demonstrate that when using administrative data to evaluate outcomes of long-term care, such selective discharge of patients may result in findings apparently at odds with clinical experience.

Pressure ulcers are a common medical condition that significantly contribute to the morbidity and mortality of medical care [7]. Extensive clinical studies have evaluated their epidemiology and identified risk factors for their development [8–11]. These studies, performed in various settings including nursing homes and acute care hospitals, have consistently demonstrated that most pressure ulcers develop during the first several weeks following admission [8,12–14]. This observation likely is due to a combination of factors, including that patients are sicker and more functionally impaired at admission, and that caretakers may not yet recognize the need for specific interventions to prevent pressure ulcer development.

On the basis of this clinical literature, we expected that recency of admission would be an important predictor of pressure ulcer occurrence. However, on examining this relationship, we found that while timing is important, its effect is not what we expected from the clinical literature. This finding highlights some of the important issues that must be considered when using administrative data to study outcomes for long-term care.

METHODS

This study makes use of the Department of Veterans Affairs (VA) Patient Assessment File (PAF). This administrative database is based on an instrument developed for use in case-mix based reimbursements in long-term care [15]. It collects a range of diagnostic and functional information on all nursing home and intermediate medicine residents that is used in determining patients’ Resource Utilization Group (RUGs II). The data are regularly collected by local staff, for each resident at each facility, semiannually on April 1 and October 1. The same form is completed, as an initial assessment, whenever a person is admitted or transferred to one of these units. Typically, no separate assessment is made for admissions within 1 week of the semiannual evaluation. Patients may thus be followed through consecutive entries in the database for changes in their health status. Continuing patients already residing in a long-term care unit will have a 6-month interval between assessments, while newly admitted patients will have a shorter interval, depending on their admission date. However, for patients discharged or dying prior to one of the semiannual assessments, there is no follow-up assessment.

Included in the database is information on pressure ulcer status detailing whether a patient has an ulcer, and the stage of the largest ulcer, on the day of assessment. Staging of the ulcers is on a 1-to-5 scale; superficial erythema of intact skin is stage 1, while an ulcer...
TABLE 1. Incidence rates (95% CI) for pressure ulcer development by cohort and bed section

<table>
<thead>
<tr>
<th>Cohort</th>
<th>Number of patients</th>
<th>Rate</th>
<th>Number of patients</th>
<th>Rate</th>
<th>Number of patients</th>
<th>Rate</th>
<th>Number of patients</th>
<th>Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(0–2 months)</td>
<td></td>
<td>(2–4 months)</td>
<td></td>
<td>(4–6 months)</td>
<td></td>
<td>(6+ months)</td>
<td></td>
</tr>
<tr>
<td>Nursing home</td>
<td>5,286</td>
<td>3.5 (3.0, 4.0)</td>
<td>2,953</td>
<td>4.9 (4.2, 5.7)</td>
<td>1,964</td>
<td>5.0 (4.1, 6.0)</td>
<td>8,203</td>
<td>3.9 (3.5, 4.4)</td>
</tr>
<tr>
<td>Intermediate medicine</td>
<td>6,574</td>
<td>4.4 (3.9, 4.8)</td>
<td>2,060</td>
<td>5.6 (4.6, 6.6)</td>
<td>1,030</td>
<td>5.3 (4.0, 6.7)</td>
<td>3,080</td>
<td>4.5 (3.8, 5.2)</td>
</tr>
<tr>
<td>Combined</td>
<td>11,860</td>
<td>4.0 (3.6, 4.3)</td>
<td>3,013</td>
<td>5.2 (4.6, 5.9)</td>
<td>2,994</td>
<td>5.1 (4.4, 5.9)</td>
<td>11,283</td>
<td>4.1 (3.7, 4.5)</td>
</tr>
</tbody>
</table>

TABLE 2. Number and percentage of new pressure ulcers that are stage 2, 3 or 4 for each of the cohorts

<table>
<thead>
<tr>
<th>Cohort</th>
<th>Total no. of new pressure ulcers</th>
<th>Stage 2 (N%)</th>
<th>Stage 3 (N%)</th>
<th>Stage 4 (N%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cohort 1</td>
<td>472 (100%)</td>
<td>257 (54.5%)</td>
<td>164 (34.8%)</td>
<td>51 (10.8%)</td>
</tr>
<tr>
<td>Cohort 2</td>
<td>262 (100%)</td>
<td>142 (54.2%)</td>
<td>80 (30.5%)</td>
<td>40 (15.3%)</td>
</tr>
<tr>
<td>Cohort 3</td>
<td>154 (100%)</td>
<td>80 (52.0%)</td>
<td>49 (31.8%)</td>
<td>25 (16.2%)</td>
</tr>
<tr>
<td>Cohort 4</td>
<td>462 (100%)</td>
<td>297 (64.3%)</td>
<td>120 (26.0%)</td>
<td>45 (9.7%)</td>
</tr>
<tr>
<td>Total:</td>
<td>1350 (100%)</td>
<td>776 (57.5%)</td>
<td>413 (30.6%)</td>
<td>161 (11.9%)</td>
</tr>
</tbody>
</table>

Comparison of cohort designation versus ulcer stage: p < 0.01.
have generally been small, in total numbering several hundred pa-
patients. The consistency of this finding across many different clinical
bases should be interpreted cautiously as data may be of questionable
quality [19], important information may be lacking [20], and it may be
difficult to adjust for disease severity [21]. Administrative databases
used in long-term care have additional limitations when compared to
acute hospital databases. Information on patient discharges and deaths
is usually not available. Rather than capture an entire episode of care,
they capture information on fixed dates of the calendar year. Conse-
quently, patients may be lost from the database in a nonrepresentative
manner. This may lead to paradoxical findings when evaluating out-
comes of long-term care. In this study, we present one such example,
and examine possible explanations as to how these results may arise.
These findings help elaborate on potential pitfalls in interpreting ad-
ministrative data, such as the PAF, when studying health outcomes in
long-term care.

In our study sample, long-term care residents institutionalized for
less than 2 months were less likely to have developed a pressure ulcer
when compared to residents institutionalized for 3–6 months. Resi-
dents in cohort 1 had an incidence rate of 4.0%, as compared to rates
of 5.2, 5.1, and 4.1% for residents in cohorts 2, 3, and 4 respectively.
This may appear to suggest that many pressure ulcers are more likely
to develop later in the hospitalization, a finding contrary to clinical
observations [8,12–14]. For example, in one prospective study that
followed newly admitted patients to a nursing home for a 3 month
period, 92% of the pressure ulcers developed during the first 3 weeks
of institutionalization [8].

One possible explanation is that pressure ulcers may indeed be more
likely to develop later in the long-term care stay. The study sample
that we created from the PAF database contains information on more
than 30,000 patients. Clinical studies evaluating this issue, in contrast,
have generally been small, in total numbering several hundred pa-
tients. The consistency of this finding across many different clinical
studies, as well as its clinical plausibility, suggests that it is unlikely
that the administrative database is providing the "true" result.

Residents in cohort 1 may differ from residents in cohorts 2 and 3
at the time of their admission to the long-term care units. Conse-
quently, they may be at lower risk for pressure ulcer development.
There is no reason, however, that residents in cohort 1, admitted in
either February, March, August, or September, should be systemati-
cally different at the time of their admission from residents admitted
in other months.

The administrative database contains information on pressure ulcer
status at a fixed point in time and calculates incidence rates by compar-
ing long-term care residents at consecutive points. There is no infor-
mation on pressure ulcers that develop and heal between these assess-
ments. Consequently, many pressure ulcers are likely to be missing
from the database. If pressure ulcers developing among residents in
cohort 1 were more likely to heal than ulcers developing in cohorts 2
and 3, then the calculated incidence rate for cohort 1 would be lowered
relative to cohorts 2 and 3. However, it seems unlikely that pressure
ulcers in cohort 1 are healing more during the shorter follow-up period.

Another possible explanation is that pressure ulcers developing in
the first 2 months persist and become larger. However, two observa-
tions argue against this. First, pressure ulcers noted in cohorts 2 and
3 were not larger, as evidenced by their stage, when compared to
ulcers in cohort 1. The distribution of stage 2, 3, and 4 ulcers was
similar among the three cohorts. Only in cohort 4 which contains
many long-stay residents, was a difference noted in this distribution.
Second, this runs counter to observations on the natural history of
pressure ulcers. We have previously established that most stage 2 ulcers
heal within several weeks [17,22]. Thus the majority of ulcers would
be unlikely to persist for an extended period of time.

We believe that these results arise through the selective discharge
of pressure ulcer patients during the first 2 months after admission,
and of low-risk patients without an ulcer at later dates. Patients with
pressure ulcers have been noted to have increased mortality rates, and
are likely to be transferred more frequently to acute care hospitals,
than are patients without a pressure ulcer. We have previously shown
that patients developing a pressure ulcer in the first several weeks
following admission have a threefold increase in 6-week mortality [22].
Such selective discharge of patients from long-term care units, if lim-
ited to patients developing pressure ulcers during the first 2 months of
institutionalization, would result in fewer pressure ulcers for cohort 1
patients at the time of their follow-up semiannual assessment. This
would disproportionately decrease the numerator (number of new ul-
cers) when calculating the incidence rate. Supporting this possibility,
the rate of pressure ulcer development in cohort 1 is considerably lower
than that reported in observational studies [23,24]. This suggests that
many pressure ulcers occurring in patients institutionalized for short
periods of time (< 2 months) may be lost from the database prior to the
final semiannual assessment.

Similarly, many long-term care residents are admitted for short
courses of rehabilitation that may require several months of therapy
[25–27]. Residents admitted for rehabilitation may be at lower risk for
developing a new pressure ulcer than residents admitted for chronic
care. The selective discharge of many low-risk residents without a
pressure ulcer after 3 to 6 months of institutionalization would dispro-
portionately decrease the denominator (number of patients at risk)
and, as a result, artificially elevate the rate for residents in cohorts 2
and 3. That many long-term care residents are being discharged during
the 6-month period following admission is clearly demonstrated by the
progressive decrease in the size of cohorts 1, 2, and 3.

Supporting our hypothesis regarding the selective discharge of resi-
TABLE 3. Results of logistic regression model predicting pres-
sure ulcer development

<table>
<thead>
<tr>
<th>Variable</th>
<th>Odds ratio</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cohort 2 or 3</td>
<td>1.28</td>
<td>(1.14, 1.44)</td>
</tr>
<tr>
<td>Cohort 4</td>
<td>0.98</td>
<td>(0.85, 1.12)</td>
</tr>
<tr>
<td>Residing on intermediate medicine</td>
<td>1.23</td>
<td>(1.10, 1.38)</td>
</tr>
<tr>
<td>Dependence in transferring</td>
<td>2.29</td>
<td>(1.92, 2.72)</td>
</tr>
<tr>
<td>Dependence in mobility</td>
<td>2.04</td>
<td>(1.65, 2.53)</td>
</tr>
</tbody>
</table>
students, long-term care residents in cohort 1 were significantly less functionally impaired, as defined by mobility and transfer skills, than residents in the other cohorts. As previously stated, because we have no reason to assume that cohorts were different at their time of admission, these observed differences in our sample could arise only through the selective discharge of more functionally impaired residents during the first 2 months, and/or less functionally impaired residents at later times. The fact that cohort remained a significant predictor in the logistic model even after adjusting for functional status suggests that there must be other risk factors for pressure ulcer development not captured by the database that are being similarly affected.

We have demonstrated how the use of a large administrative database for long-term care may result in conclusions apparently at odds with a well-accepted clinical observation. These results should not imply that administrative databases are of limited value in studying outcomes of long-term care. Rather, they emphasize that caution is needed when evaluating health outcomes with administrative databases. Specifically, we make the following recommendations concerning their use in long-term care. First, researchers and policy makers should know in detail the structure of the database and when data are collected. In particular, incidence rates calculated from cross-sectional data should be cautiously interpreted. Second, close attention is required in determining whether specific subgroups of patients have been excluded from the database and how this will affect the outcome of interest. Third, recency of admission should be considered as an important adjustor when evaluating long-term care outcomes. Finally, as with all studies employing administrative databases, analyses should incorporate not only appropriate statistical techniques, but also sound clinical judgments.

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References