The NYU Classification System for ED Visits: WSHA Technical Concerns

The New York University (NYU) model[1] frequently used in emergency department (ED) studies was developed by researchers as an "ED use profiling algorithm" to describe patterns of ED use across different patient populations. Although this analytic model is often labeled as the only available ED classification system as justification for its use, the Washington State Hospital Association (WSHA) is reluctant to apply this model to our own set of ED claims data, even as a default. Our experience in using this algorithm led us to conclude that it is more than simply "flawed."

The model is outdated.

The algorithm – Buy cialis online

The NYU research for the model occurred in the late 1990s, for use on claims data back to 1990. The key to the algorithm is the primary diagnosis, which is identified by the ICD-9 code valid at the time of service. The model associates a diagnosis code with a specific set of probabilities for the various categories of emergent or non-emergent care. The visit claim, with its set of category probabilities, is the building block of the model.

The problem is that the ICD-9 codes are subject to change each year, but the model's program application has not been updated since 2001. Codes may be deleted, or redefined, or new ones created. A diagnosis code valid in 1996 may not be valid in a later year, and so it does not show up in later datasets. It may be redefined so that its meaning is outside the modelers' intent and is associated with the wrong set of probabilities. New diagnosis codes are not recognized by the program and are given no category probabilities; a valid claim is treated as missing data.

WSHA conducted a pilot study in 2007, collecting ED 2006 claims data from 23 member hospitals. The NYU model was applied to the data, at the request of state policymakers with whom we were collaborating. For that study, 12 percent of the 2006 claims "fell through" the algorithm, labeled "ungroupable," and were consigned to the missing data bin.

[1] The New York University Center for Health and Public Service Research, and the United Hospital Fund of New York, collaborated on this research.

A Program of the Washington State Hospital Association

300 Elliott Avenue West
Suite 300
Seattle, WA 98119-4118
Phone 206-281-7211
Fax 206-283-6122

www.wsha.org

There were 3,195 primary diagnosis codes in the "fell through" group that were not recognized by the program; they were either new ICD-9 codes, or codes that had not been included in the original NYU algorithm.

WSHA is currently preparing a report on a statewide ED study of 2.6 million claims collected from 64 member hospitals for the January 2008 - June 2009 period. Our initial application of the NYU algorithm yielded an ungroupable rate of 19 percent – one out of five visits could not be evaluated by the program. For this study, with data just two to three years more recent, 5,120 diagnosis codes were unrecognized. Without a thorough updating and annual maintenance, the algorithm will continue to throw increasing numbers of valid ED claims into "missing data."

The categories –

An updating of the ICD-9 code table used in the algorithm is not all that would be required for keeping the model current. We would normally expect that standards of medical practice change over time as clinical research is produced, and so what medical conditions emergency physicians consider

- Non-emergent,
- Emergent/primary care treatable,
- Emergent/emergency department care required but preventable/avoidable,
- Emergent/emergency department care required, not preventable/avoidable, or
- Unclassifiable,
- based on whether contact with the medical system is required within 12 hours,

are likely to have also changed since the late 1990s. This shortcoming is much more difficult to quantify, but it is not trivial.

The fifth category, unclassifiable, is a bit like the elephant in the room, but we have a hard time ignoring it. In WSHA's 2007 study, 42 percent of the visit claims fell into this category, a catch-all for

- injury and trauma,
- mental illness,

- substance abuse,
- other primary diagnosis codes that had too few cases in the original NYU research to develop a set of category probabilities for,
- those admitted to inpatient care, and
- the ungroupable claims noted above.

In WSHA's current study, 46 percent of all visit claims fell into the unclassifiable category. Excluding instances of injury, trauma and inpatient admissions, that are logically emergent, appears to artificially shrink the emergent categories relative to the non-emergent one. The problem is somewhat mitigated when all categories including unclassifiable are reported. But in 2000, the NYU team published a report of their study that computed category percentages based only on the four defined emergent/non-emergent categories,[2] which skewed the relative proportions of non-emergent and emergent care.

The model categorizes populations, not visits.

Often, the studies that use the NYU model present it as a method of categorizing ED visits: visits are determined to be non-emergent or an emergent type, and a category's percentage is based on the number of visits assigned to it. But this is a misleading simplification of the methodology.

The NYU algorithm actually assigns a ***set*** of four probabilities to each visit, one value for each emergent/non-emergent category, based on the primary diagnosis code. So, all visits with the same diagnosis code are assigned the same set of probabilities. The majority of visits are characterized by more than one non-zero probability.

For example, the diagnosis code 487.1 (Influenza, with other respiratory manifestations) is associated with a

- 50 percent likelihood that it is a non-emergent case, and a
- 25 percent likelihood that it is an emergent: primary care treatable case, and a
- 0 percent likelihood that it is an emergent: preventable/avoidable case, and a

[2] Billings, John, Nina Parikh, and Tod Mijanovich, "Emergency Room Use: The New York Story," Issue Brief, The Commonwealth Fund, November 2000, www.cmwf.org.

- 25 percent likelihood that it is an emergent: not preventable/avoidable case.

Those visits with that specific diagnosis code are ***not*** put into the non-emergent category, where the probability is the highest. There is another step here: Those visits' probability values are put into each category, with the probabilities for all other visits; a weighted mean is then computed for each category. This average probability serves as an ***estimate*** of the proportion of visits that are non-emergent or emergent.

For example, WSHA's 2007 ED study found these estimates for the five categories for the entire sample:

- 19% Non-emergent
- 20% Emergent: primary care treatable
- 7% Emergent: ED care required but preventable/avoidable
- 12% Emergent: ED care required, not preventable/avoidable
- 42% Ungroupable/unclassifiable

To calculate a set of estimates for a particular population, perhaps by payer, the computation re-sorts the visits, by payer, and constructs category estimates for each payer group. Again, from WSHA's 2007 ED study, the visits for the Medicaid population were estimated to fall into the five categories by these percentages:

- 22% Non-emergent
- 21% Emergent: primary care treatable
- 7% Emergent: ED care required but preventable/avoidable
- 10% Emergent: ED care required, not preventable/avoidable
- 41% Ungroupable/unclassifiable

The point here is that in the NYU model, specific visit claims are not labeled emergent or non-emergent. The model does not evaluate each visit claim as necessary or unnecessary, appropriate or not appropriate.

The model is not a triage system.

The NYU model does not provide protocols or a set of standards for assessing the necessity of ED care when patients enter the ED.

The evaluation of the scope of necessary or unnecessary care is ex post facto, based on an analysis of the whole body of primary diagnosis codes for the patient population.

The NYU researchers made this point clearly:

> "The algorithm is not intended as a triage tool or a mechanism to determine whether ED use is appropriate for required reimbursement by a managed care plan. Since few diagnostic categories are clear-cut in all cases, the algorithm assigns cases based on a percentage basis, reflecting this potential uncertainty and variation. Nor was it intended to assess appropriateness of ED utilization. Use of the emergency department for minor conditions may well be rational and appropriate if a patient has no other source of care. Moreover, assessment of urgency by patients can be problematic, and labeling ED use for primary care treatable conditions as inappropriate may misallocate responsibility to the patients themselves."[3]

Jane Feldman
August 24, 2010

[3] Billings, John, Nina Parikh, and Tod Mijanovich, "Emergency Room Use: The New York Story," Issue Brief, The Commonwealth Fund, November 2000, www.cmwf.org.