*TREXIN INSIGHT PAPER*

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# ACUTE MYELOID LEUKEMIA

*A Data Science Analysis of Initial Disease Management Costs and Treatment Alternatives*

Acute Myeloid Leukemia (AML) is the most common acute leukemia in adults with an incidence that increases with age. It accounts for about 1% of US cancer deaths and its burden is expected to increase as the population ages. We conducted a preliminary analysis of outcomes and resource utilization for Medicare beneficiaries with AML first diagnosed in 2003 or 2004, using Medicare Public Use Standard Analytic claims files. The purpose of this analysis was to better understand the patterns of resource use in connection with treatment of AML and assess possible experimental designs for a study looking into the economic as well as clinical benefits of stem cell transplantation in AML. The time frame selected was one of convenience and while more timely data would provide contemporary estimates this older sample can help illuminate design issues for other analyses.

The study population consisted of all Medicare beneficiaries in the 5% Public Use File that had a first diagnosis of AML (205.0X) in either 2003 or 2004, with enrollment in Medicare for one year prior to the first diagnosis of AML and no diagnosis of AML for at least 12 months prior to the recorded index diagnosis. This yielded a study population of 1,767 subjects. Patient health state was assessed prior to first diagnosis of AML using the Recent History of ACute and Chronic Illness (RHACCI) score and subjects were grouped by quartiles of the score. Because exploratory analysis indicated that large portion of AML subjects were often diagnosed with other forms of lymphoma either immediately prior to AML or concurrent with AML, this was also used as a measure of patient complexity.

Resource use and survival were summarized for the first and second year following first diagnosis of AML, as well as the year prior to the diagnosis of AML to understand the differential effect of AML. Resource use was summarized over all forms of care and examined for specific events ordinarily associated with cancer treatment. These included diagnoses of neutropenia, pneumonia, septicemia, UTI and anemia. We looked specifically for visits associated with chemotherapy delivery and hospitalizations for neutropenia, pneumonia, septicemia, UTI, stem cell transplant and complications due to stem cell transplant.

The final study sample size was 1,767 subjects. Mortality was 49.3% at one-year post diagnosis and 60.4% at two years post diagnosis. We found that 20% of subjects had other types of lymphoma in the year prior to AML and that 60% had other lymphomas concurrent with AML during the first year with AML. While it is possible that some of these cases coded with multiple types of lymphomas might represent miscoding of either AML or another lymphomas, those with AML plus another type of lymphoma had twice the one year mortality rate, indicating that it is likely that multiple type of cancer were present at the same time in most of these cases. Having other lymphomas concurrent with AML greatly increased the one year risk of death, which was 31.4% for those with no other lymphomas to 62.4% for those with other lymphomas. Mortality in the first year following the diagnosis of AML was greatly affected by prior year health state increasing from 35.4% in the first quartile of overall health-state to 62.4% for the fourth quartile (a 40% increase). Combing these two factors we found a five-fold difference in one-year mortality between those in the lowest severity quartile with no other

type of lymphoma (15%) compared to those in the highest severity quartile with other lymphoma (77%).

The first year with AML had an average cost triple the amount of the year prior to the diagnosis of AML ($39,132 vs. $12,641), with approximately two-thirds of that associated with hospital costs ($28,062). Complications were common in the population with 30% experiencing neutropenia, 35% with pneumonia and 27% with a urinary tract infection in the first year with AML. Altogether these complications occurred in 60% of all patients, with costs more than three times higher for those with complications compared to those without, ($55,490 vs. $14,374 respectively).

Bone marrow transplant is seen as a definitive therapy in AML for those that fail initial treatment. However, for this time frame it was a fairly rare treatment being used in only 1% (20 subjects) and with all but one transplant case being in subjects with the added complication of other lymphomas. Given the very small sample size it was not surprising that there was no survival advantage for those with transplant and given the very high one-year mortality there was no time for transplant to show a benefit of lower resource use in the succeeding time frame. The cost of the transplant hospitalization was very high ($119,000) and with so few of the population under study surviving the first and second years there is no chance for the definitive treatment of AML with transplant to show economical value by avoiding other costs of care such as added hospitalizations for neutropenia and pneumonia.

One of the original purposes in undertaking this analysis was to see if AML would be a good target population to use in an economic evaluation of bone marrow transplant (BMT) where the cost of BMT could be offset by saving from avoided complications that arise in the ordinary management of AML patients. The results here indicate that because of the very high mortality rate of those that have AML, especially those with the added burden of other lymphoma; there is no time for an advantage in avoiding added costs of care to result in lower total cost. Instead the economic value of BMT is best seen through cost effectiveness analysis where the value to society of added survival is compared to the cost of the transplant. Additionally, since most the subjects in this study (and almost all the transplant patients) had other forms lymphoma a better study design would probably be to look at all beneficiaries with multiple concurrent lymphoma.

TThis TIP was written by Walter Linde-Zwirble, Chief Data Scientist, Health Economics. Walter welcomes comments and discussion on this topic and can be reached at walter.linde-zwirble@trexin.com. View Trexin's healthcare insights and expertise at www.trexin.com/healthcare.