Scottish Government Health Directorates Chief Scientist Office

CHIEF SCIENTIST OFFICE

FOCUS ON RESEARCH

Validating existing and developing new measures of comorbidity to predict mortality using Scottish routine datasets

Researchers
Prof S Wild, Dr. J Walker, Dr. D McAllister, Dr. C Weir, Dr. N Halbesma

Aim
The project's aim was to determine which of several ways of measuring comorbidity (the total burden of disease additional to some condition of main interest) can most effectively predict risk of dying in the next year in people with either type 2 diabetes (T2DM) or colon cancer. This is important to allow fair comparisons between different types of treatment or hospitals.

Project Outline/Methodology
A number of methods of measuring comorbidity using information from hospital records have been proposed, including the Charlson Comorbidity Index (CCI) and the Elixhauser Index (EI). However, these were developed many years ago using hospital data from the USA, and how well they work in modern Scottish settings has never been tested. The goals of this study were (i) to determine whether the CCI and EI can improve prediction of death within one year after diagnosis with T2DM or colon cancer, and (ii) to investigate whether new ways of measuring comorbidity offer more accurate prediction of death than the CCI / EI. The approach used was to create statistical models in which death was predicted initially by age and socioeconomic status (plus measures of size and spread of colon cancer), then adding different measures of comorbidity to see if they improved the models. We used the area under the Receiver Operating Characteristic curve (AUROC), which assesses the model's ability to separate people who did and and did not die within one year after diagnosis. Higher AUROCs suggest better models.

Key Results
Information was available for 126,648 people diagnosed with T2DM in Scotland between 01 January 2004 and 18 May 2011, and for 15,019 individuals diagnosed with colon cancer between 01 January 2003 and 31 December 2012. For men with T2DM, the AUROC increased from 0.75 (no comorbidity) to 0.81 (with CCI added) and 0.82 (with EI added). For women with T2DM, the corresponding values were 0.77 (no comorbidity), 0.83 (CCI) and 0.84 (EI). A new measure based on the method used by the NHS to record hospital admissions performed similarly to the EI. For the group with colon cancer, predictive performance (AUROC) without comorbidity was 0.84 (men) and 0.85 (women). These values hardly changed when any measure of comorbidity was added.

Conclusions
For individuals with T2DM, prediction of death within one year after diagnosis is improved when comorbidity is taken into account. For people with colon cancer, prediction of mortality is not improved when comorbidity is represented.

What does this study add to the field?
While much research has examined relationships between the two diseases featured in this study and death, little attention has been paid to the possible role of comorbidity. This study suggests that additional comorbid disease is associated with death in people with T2DM, but not in those with colon cancer.

Implications for Practice or Policy
When researching relationships between diabetes and death, or evaluating management of diabetes in the NHS, comorbidity may need to be taken into account. However, it will be necessary to ensure that comorbidity data are collected on a uniform basis across (for example) different Health Board Areas.

Where to next?
We hope (i) to repeat the study reported here for diseases other than T2DM and colon cancer, and (ii) to investigate the role of comorbidity in the relationships between certain anti-diabetes medications and death or cardiovascular disease.

Further details from:

Professor Sarah Wild, Usher Institute of Population Health Sciences and Informatics, The University of Edinburgh, Medical School, Teviot Place, Edinburgh EH8 9AG. EMAIL:sarah.wild@ed.ac.uk