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Data linkage to develop a mortality outcome measure for patients with sepsis

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Background

Monitoring sepsis outcomes over time is necessary to evaluate healthcare improvement interventions. However, it is a clinical diagnosis (infection with a systemic inflammatory response) that is not routinely recorded electronically. We aimed to create a proxy measure for sepsis mortality using routine data.

Objective

ICD-10 codes on hospital discharge summaries are often used to monitor disease outcome but the presence of a code for a specific infection, e.g. pneumonia, does not give any indication of severity of illness i.e. whether the patient had sepsis. There are ICD-10 codes that specifically indicate sepsis, most commonly A40 and A41. However, monitoring mortality using ICD-10 is susceptible to coding bias as practice differs between and within health boards. Using ICD-10 codes alone does not differentiate between changes in mortality and changes in coding practice.

As recommended in the “Sepsis 6” care bundle, all patients with suspected sepsis should have a blood culture taken urgently. A previous study showed that having a blood culture taken was associated with a 3-fold increase in risk of mortality, over other hospital inpatients, independent of having a positive or negative result. We tested whether having a blood culture taken might be a suitable proxy marker for sepsis and compared it to data using ICD-10 sepsis codes.

Method

Data on all patients that had a blood culture taken in hospital in Scotland between 2011 and 2013 were obtained from hospital laboratory systems. These data were linked to hospital discharge summary records (SMR01) and death records. Monthly 30-day mortality rates from date of blood culture were calculated. Patients with an A40 or A41 ICD-10 code were extracted

from hospital discharge summary records (SMR01) and linked to deaths records. Monthly 30-day mortality rates from date of admission were calculated over the same period of time. Blood culture sampling and, more strikingly, the use of A40/A41 codes increased over the study period. Blood culture data would indicate no significant change in 30-day mortality over the study period but coding data would indicate a 20% relative reduction.

Conclusion

A40/A41 codes lack sensitivity as the numbers of patients with these codes is many times lower than estimates of sepsis incidence, and coding practice changed dramatically over time. Blood culture data lacks specificity as many patients that had a blood culture taken will end up with an alternative diagnosis. Combining a broader group of infection codes with blood culture data may be a more useful measure.

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