Canadian Mortality Rates for Liver Disease

Taking a Closer Look at ICD Coding

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Statistics Canada (StatCan) ranks 'chronic liver disease and cirrhosis' as the thirteenth leading cause of death (Table I).¹ However, closer examination of vital statistics information on mortality rates indicates that many liver-related conditions, such as viral hepatitis and hepatocellular carcinoma, are not taken into consideration. Instead, these common primary liver problems are classified in other categories such as "infectious or parasitic disease" and 'malignant neoplasms', respectively. Appropriate representation of data impacts on public perception of leading causes of death in Canada. The variance in reporting may also influence the design and delivery of health services by regional health authorities.

The International Classification of Diseases (ICD) was developed collaboratively by the World Health Organization (WHO) and 10 international centers. It was designed to promote international comparability in the collection, processing, classification, and presentation of mortality statistics.² Each year, StatCan publishes shelf tables on causes of death based on the 9th revision of the ICD (ICD-9). The underlying cause of death as listed on the death certificate is assigned a numeric code based on ICD-9. StatCan will be using the 10th revision of ICD (ICD-10) with future publications.

Using the most recent data released by StatCan, we determined the true mortality rates in Canada for all identifiable liver diseases contributing to death. Comparison was then made to the published rates for 'chronic liver disease and cirrhosis', to demonstrate the level of discrepancy. We also tabulated the main causes of liver disease that require consideration in assessing overall mortality from liver disease. Similar templates for other disease categories have been generated. These organ or specialty-specific templates will be more useful for future studies on burden of disease. Finally, we identified the conversion algorithm for the relevant liver diseases, between ICD-9 and ICD-10 coding.

Since tables on causes of death are not yet available for the year 2000 and beyond, ICD-9 was used. Data from 1997 to 1999 were reviewed. The classification of 'chronic liver disease and cirrhosis' alone is based on ICD-9 category 571. In determining the mortality rates for all liver disease, however, several additional categories were considered (Table II). Age-standardized mortality rates were calculated based on a formula applied by StatCan, with the reference population for weighting based on the standard population by age group in Canada on July 1, 1991.

As demonstrated in Table II, the majority of deaths (40.2%) are due to ICD-9 category 571. However, a significant proportion of liver disease is classified apart from the group of 'diseases of the digestive system', which correlates with ICD-9 categories 520 to 579. Relevant categories such as viral hepatitis (070), hereditary hemochromatosis and Wilson's disease (275), primary hepatic malignancy (155), liver disorders in pregnancy (646.7), and acetaminophen toxicity (965) among others, are classified separately. Without further scrutiny, these entities would not be counted in the spectrum of liver disease.

In 1999, the age-standardized mortality rate for 'chronic liver disease and cirrhosis' was 6.2 per 100,000. However, using the data in Table II, the mortality rate for all liver disease is 15.4 per 100,000. Comparable rate increases were also determined for 1997.

Even with the sources available, it is difficult to include every liver-related problem in order to determine the overall mortality rate. Our goal was not necessarily to be comprehensive, but to demonstrate that if one only looked at the data for 'chronic liver disease and cirrhosis', it would be an underestimation of death from 'liver disease'.

This is not a criticism of the ICD system, but rather an attempt to raise awareness on the part of not only researchers, but also staff responsible for completing death certificates. The importance of coding properly is underlined by its role in epidemiological studies and research into the quality of health care. There are inherent problems with the determination of cause of death in death certificates.³ The miscertification and the resultant assignment of misleading ICD codes,⁴ particularly for ill-defined conditions, are important factors affecting mortality trends.⁵ Accurate coding requires a working knowledge of medical terminology and ICD conventions. Errors may be due to improper selection of the underlying cause of death, biases in diagnoses, and incomplete death certificates. Despite the inaccuracies of the system, use of ICD-9 data remains the most satisfactory method of identifying specific diagnostic groups for large-scale audits.⁶ In part due to the diverse grouping of ICD-9, there is discrepancy in reporting, especially in the context of liver disease.⁷

The latest coding system (ICD-10) will not correct these discrepancies, despite its greater detail.⁸ It contains over 8,000 categories, which is almost twice the number of categories for causes of death seen in ICD-9. Table II summarizes our attempt to provide conversion codes from ICD-9 to ICD-10 for liver disease. However, the conversion between ICD-9 and ICD-10 is only approximated because of the increased level of detail. As an example, viral hepatitis has been expanded from a single category (070) in ICD-9, to five categories (B15 to B19) in ICD-10. Categories 15 to 17 include acute viral

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hepatitis, while categories 17 to 19 include chronic or unspecified viral hepatitis. Despite this detail, Table II demonstrates the persistence of the diversity of the categories that need to be accounted for when examining liver disease mortality under both ICD-9 and ICD-10, as in the latter, viral hepatitis is categorized separately from the core of liver diseases in categories K70 to K77. The number of deaths from viral hepatitis (309) in 1999 verifies the importance of this, as it was ranked the third highest cause of deaths behind chronic liver disease and hepatic malignancy.

Table II was developed to serve as a template for our own research, to follow prospective trends in mortality within Nova Scotia. The importance of this work is justified by the predicted increased burden of liver disease and its mortality in the future. A Canadian group demonstrated that age-standardized mortality for hepatitis B and hepatitis C increased respectively from 0.03 and 0.12 deaths per 100,000 in 1979 to 0.26 and 0.41 deaths per 100,000 in 1997.⁹ They also predicted the number

TABLE I

Leading Causes of Death in Canada, 1997

Cause of Death	Number	Rate*
All Causes	215,669	658.7
Cancers	58,703	181.5
Diseases of the heart	57,417	173
Cerebrovascular diseases	16,051	47.8
COPD and allied conditions	9,618	29
Unintentional injuries	8,626	27.6
Pneumonia and influenza	8,032	23.7
Diabetes mellitus	5,699	17.4
Hereditary and degenerative diseases of the CNS	5,049	15
Disease of arteries, arterioles, capillaries	4,767	14.3
Psychoses	4,645	13.6
Suicide	3,681	12
Nephritis, nephrotic syndrome, nephrosis	2,654	8
Chronic liver disease and cirrhosis	2,030	6.4
Neurotic disorders, personality disorders and other nonpsychotic mental disorders	1,163	3.5
HIV infection	626	2

Source: Statistics Canada, Health Statistics Division¹

* Age-standardized mortality rate per 100,000 population.

of deaths from hepatitis C to increase by 126% over the next decade.¹⁰ In terms of its use outside of Atlantic Canada, we hope this table will serve as a template for any group assessing mortality from liver disease and its trends, during conversion from ICD-9 to ICD-10. Already the trend has begun for various specialties to formulate similar templates. For example, the British

Association of Dermatologists and the International League of Associations for Rheumatology have been granted permission by the WHO to prepare their own applications of ICD for their respective fields.¹¹

In current times, when demands for accountability are resonating at all levels of the health care system in Canada, it is

TABLE II

Deaths from Liver Disease in Canada in 1999, Based on ICD-9 Coding

ICD-9 Category	ICD-9	ICD-10	Description	Deaths
Amebiasis	6.3	A06.4	Amebic liver abscess	0
Infectious/parasitic disease: other viruses	70	B15-19	Viral hepatitis	309
Infectious/parasitic disease: helminthiasis	120	B65/K77.0	Schistosomiasis	1
Echinococcus	122	B67.0/K77.0	Echinococcus granulosus, multilocularis, unspecified	0
Malignant neoplasms: digestive organs, peritoneum	155	C22	Malignant neoplasms of the liver and intrahepatic bile ducts	1276
Malignant neoplasms: digestive organs, peritoneum	156	C23-24	Malignant neoplasms of the gallbladder and extrahepatic ducts	504
Benign neoplasms: digestive organs, peritoneum	211.5	D13.4-13.5	Benign neoplasms of the liver and biliary passages	1
Neoplasm of uncertain behaviour	235.3	D37.6	Neoplasms of uncertain behaviour of liver and biliary passages	2
Disorders of amino acid transport, metabolism	270	E70.2,72.2	Tyrosinemia, Urea cycle disorder	0
Disorders of carbohydrate transport, metabolism	271	E74.0	Glycogen storage disease	0
Disorders of mineral metabolism	275	E83.0-83.1	Hemochromatosis, Wilson's disease	0
Unspecified disorders of metabolism	277.4	E80.4-80.6	Gilbert's, Rotor's, Dubin-Johnson, Crigler-Najjar	0
Hereditary and degenerative disease of the CNS	331.8*	G93.7	Reye's Syndrome	0
Disease of veins, lymphatics, circulatory system	452	I81	Portal vein thrombosis	12
Disease of veins, lymphatics, circulatory system	453.0	I82.0	Budd Chiari Syndrome	5
Disease of veins, lymphatics, circulatory system	456.0	I85.0	Esophageal varices and bleeding	14
Disease of veins, lymphatics, circulatory system	456.1	I85.1	Esophageal varices without mention of bleeding	5
Other diseases of digestive system	570	K72	Acute and subacute necrosis of the liver	27
Other diseases of digestive system	571	K70,73,74	Chronic liver disease and cirrhosis	2091
Other diseases of digestive system	572	K75	Liver abscess and sequelae of chronic liver disease	306
Other diseases of digestive system	573	K71,76,77	Other disorders of the liver	148
Other diseases of digestive system	574	K80	Cholelithiasis	142
Other diseases of digestive system	575	K82	Other disorders of the gallbladder	182
Other diseases of digestive system	576	K83	Other disorders of the biliary tract	136
Other complications of pregnancy, NEC	646.7	O26.6	Liver disorders of pregnancy (e.g., Acute fatty liver)	0
Congenital anomalies of digestive system	751.6	Q44	Congenital anomalies of gallbladder, bile ducts, liver	7
Other perinatal jaundice	774.4	P59.2	Perinatal jaundice with hepatocellular damage	0
Symptoms/signs, and ill-defined conditions	782.4	R17	Jaundice (unspecified, not of newborn)	3
Symptoms/signs, and ill-defined conditions	789.5	R18	Ascites	1
Poisonings by drugs, biologic substances	965.4	T39.1	Poisoning by aromatic analgesics (e.g., acetaminophen)	31
Poisonings by drugs, biologic substances	968.1	T41.0	Poisoning by halothane	1
Toxic effects of nonmedicinal substances	982.1	T53.0	Poisoning by carbon tetrachloride	2
Toxic effects of noxious substances	988.1	T62.0	Amanita phalloides	0
Complication of transplanted organ	996.8†	T86.4	Liver	0

Data from Statistics Canada¹

* Reye's syndrome does not have its own ICD-9 coding. It is classified specifically in ICD-10

† Complications of liver transplant (failure, rejection) do not have their own ICD-9 coding. They are categorized specifically in ICD-10.

CNS = central nervous system

NEC = not elsewhere classified

important that we agree on ways of reporting Canadian mortality rates with the appropriate clinically relevant groupings. Knowledge of the mortality rate of liver disease is important not only to the public, but also to health care providers. This is especially true for those involved in primary care, where awareness of this information may influence the prioritization of these patients with respect to referral and treatment. The high-ranking mortality rate of overall liver disease also emphasizes the importance of appropriate resource allocation in terms of funding and manpower, to a disease that has been underestimated. It is time to take a closer look!

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Received: July 28, 2003

Accepted: November 18, 2003

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