Letter to the Editor

Identifying alcoholic liver disease patients using electronic health records within an integrated health system

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Alcoholic liver disease (ALD) is one of the most common causes of liver disease in the United States and is currently the number one indication for liver transplantation (1). Identifying patients with ALD is a challenge given the subjectivity in the documentation of significant alcohol consumption and establishing evidence for liver injury (2). Developing a reliable and accurate method for identifying ALD using an electronic health record (EHR) based approach would pave the way for large-scale studies providing essential insights into epidemiology, management strategies, and improving outcomes. Among a large, diverse, real-world population of an integrated health system with a comprehensive EHR, we sought to determine the accuracy of International Classification of Disease (ICD) codes in identifying patients with ALD.

A cross-sectional study was performed within Kaiser Permanente Southern California (KPSC) from January 1, 2007, to December 31, 2021. KPSC is an integrated health system comprised of 15 medical centers and over 200 satellite clinics caring for more than 4.8 million members. The study population was derived from KPSC members aged 18 years or older with at least 6 months of continuous membership. The 6-month membership criteria ensured adequate data capture for each member where providers could document and code for diagnoses. Dates from 2007 onward were used as the KPSC EHR was fully implemented into clinical practice starting in 2007. No exclusion criteria other than the above listed were selected because we sought to comprehensively capture the ALD population and recognize other liver diseases or comorbidities that may coexist with ALD. The study was conducted in accordance with the Declaration of Helsinki (as revised in 2013). This study was approved by the Institutional Review Board of KPSC (IRB #13223) and exempted from informed consent given the retrospective nature of the study.

ICD codes were used to capture individuals with ALD. Precisely, ICD-9 codes (571.3, 572.2, 571, 571.1, 789.59, 571.2, 571.9) and ICD-10 (K70.9, K70.4, K70.41, K70, K70.1, K70.11, K70.2, K70.3, K70.31) were used. These ICD codes were inclusive of ALD, which includes alcoholic fatty liver, alcoholic hepatitis, alcoholic fibrosis, alcoholic cirrhosis, and alcoholic liver failure. Individuals were identified as ALD if they had two or more ALD codes on separate encounters given higher specificity with multiple encounter codes (3).

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Table 1 Chart review confirmation of patients ICD coded for alcoholic liver patients

Codes used	Yes, n	No, n	Total, n	PPV (%)
ICD-9	54	46	100	54
ICD-10	98	2	100	98
Total	152	48	200	76

ICD, International Classification of Disease; PPV, positive predictive value.

Among patients who were identified with ALD, a total of 200 charts were randomly selected for manual chart review. At least five random patients were selected each year of the study window to sample patients across all years being studied appropriately. One hundred charts were selected based on ICD-9 (1/2007–12/2015) and 100 charts by ICD-10 (1/2016–12/2021) codes.

Confirmation of ALD was defined as meeting one of two criteria. (I) Gastroenterology or Hepatology encounter note documenting ALD or an encounter note by any healthcare provider documenting alcohol consumption or alcohol use disorder; and (II) evidence of liver injury, which included liver enzyme elevations above normal range or imaging studies to suggest liver disease.

We calculated the positive predictive value (PPV) of ICD codes for confirming ALD using all codes and ICD-9 and ICD-10 codes separately. Finally, we evaluated the reasons for the discrepancy among patients not confirmed as ALD on chart review.

Overall, 32,852 patients had at least one code for ALD in the observation window [2007–2021]. This number declined to 20,100 individuals with ≥2 separate ALD encounter codes which comprised the study population. The median (interquartile range) age was 59.0 (50.0, 68.0) years with 62% males, 6% Asian, 8% black, 38% Hispanic, and 46% non-Hispanic white patients. Among 200 charts which were randomly selected for chart review, ALD was confirmed in 152 patients, equating to a PPV of 76%. When evaluating ICD code versions, ALD was confirmed in 54 (out of 100) individuals coded with ICD-9 and 98 (out of 100) with ICD-10 codes. Thus, the corresponding PPVs were 54% and 98% for ICD-9 and ICD-10, respectively (*Table 1*). Of the 48 patients that did not meet the criteria for ALD, 44 (22%) had no evidence of documented alcohol consumption, and 4 (2%) had no evidence of alcohol consumption but rather documentation mentioning non-ALD including a hepatology encounter indicating likely metabolic dysfunction-associated steatotic liver disease (MASLD).

While ALD is the most common liver disease, large-scale studies to determine the epidemiology and outcomes of ALD are lacking but would provide valuable insights into the identification and management of this population. The coronavirus disease 2019 (COVID-19) pandemic has further heightened the awareness of ALD, where alcohol sales rose to an all-time high, and subsequent hospitalizations for alcohol-induced liver injury continued to increase (4,5). Identifying the ALD population has been a challenge owing to the difficulty in diagnosis, clinician awareness, and patient follow-up. Few studies have evaluated diagnosis codes for accurately identifying liver disease patients. To date, we are aware of one study in 2023 that evaluated the PPV of ICD-10 codes in capturing alcoholic hepatitis that observed a PPV of only 45% (6).

We observed a marked difference in the PPV for ICD-9 compared to ICD-10 codes. We suspect the low PPV for ICD-9 is due to less specific ALD descriptives with ICD-9 codes. With the evolution of the EHR at KPSC, documentation may not have been as comprehensive in the earlier years of adoption (2006 onward). Moreover, documenting social history including alcohol use, was likely less common in the prior decade compared to the contemporary practices emphasizing social determinants of health. We hypothesize that the increasing awareness of alcohol use disorder more recently has led to more referrals with hepatology and subspecialties. Among patients who were confirmed ALD, the majority had documented alcohol use disorder or alcohol abuse from addiction medicine or gastroenterology/hepatology encounters.

Potential limitations that may confound the interpretation of our findings include the relatively small number of charts examined and the heterogenous criteria to confirm ALD which relied heavily on provider coding and documentation. However, our study highlights the fact that a gold standard validation criterion for ALD does not exist and is lacking. We acknowledge that there may be other liver conditions that can produce laboratory and imaging evidence of liver injury. ALD can also co-exist with other liver diseases including MASLD. Moreover, hepatitis C virus (HCV) was the primary indication for liver transplantation during the ICD-9 period. With higher cure rates for HCV, ALD has become the prominent reason for liver transplantation during the current ICD-10 era and likely to be emphasized more. Finally, we did not have information on hierarchical order of ALD diagnoses. For example, ALD as a principal inpatient discharge diagnosis

would be more likely to capture true ALD patients.

Our findings suggest that capturing the ALD patient population using ICD-10 codes may be more reliable for future ALD studies than ICD-9 codes. Although studies using ICD-9 may be helpful for the initial screen for capturing ALD patients, we caution against the sole use of ICD-9 in evaluating ALD patients without alternative validation tools such as manual chart review.

In summary, we observed that using ICD-10 codes may be a reliable EHR-based approach to identify patients with ALD and may help establish a foundation for extensive population-based studies in ALD.

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Footnote

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Ethical Statement: The authors are accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved. The study was conducted in accordance with the Declaration of Helsinki (as revised in 2013). This study was approved by the Institutional Review Board of KPSC (IRB #13223) and exempted from informed consent given the retrospective nature of the study.

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