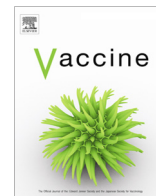




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Short communication

An audit of the reliability of influenza vaccination and medical information extracted from eHealth records in general practice

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ABSTRACT

To evaluate the reliability of information in general practice (GP) electronic health records (EHRs), 2100 adult patients were randomly selected for interview regarding the presence of specific medical conditions and recent influenza vaccination. Agreement between self-report and data extracted from EHRs was compared using Cohen's kappa coefficient (κ) and interpreted in accordance with Altman's Kappa Benchmarking criteria; 377 (18%) patients declined participation, and 608 (29%) could not be contacted. Of 1115 (53%) remaining, 856 (77%) were active patients (≥ 3 visits to the GP practice in the last two years) who provided complete information for analysis. Although a higher proportion of patients self-reported being vaccinated or having a medical condition compared to the EHR (50.7% vs 36.9%, and 39.4% vs 30.3%, respectively), there was "good" agreement between self-report and EHR for both vaccination status ($\kappa = 0.67$) and medical conditions ($\kappa = 0.66$). These findings suggest EHR may be useful for public health surveillance.

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1. Background

Seasonal influenza is a potentially life-threatening respiratory illness affecting 5–15% of the population during annual epidemics [1]. Yearly vaccination is recommended for persons at increased risk of influenza-associated complications, including older adults, young children and individuals with certain medical conditions. In Australia, influenza vaccines are provided at no cost to these groups under the National Immunisation Program [2]. Routine monitoring of influenza vaccines is important for evaluating public health programs.

Although a national immunization register has recorded childhood vaccination since 1996 [3], until recently, no such register has been available for recording adult immunizations in Australia. Instead, population-wide estimates of influenza vaccine coverage are typically measured through resource-intensive surveys. Elec-

tronic health records (EHRs) are a possible source of vaccination information and may be a low-cost solution for regularly monitoring influenza vaccine uptake. Despite the possible advantages of this approach, the validity of vaccine information in EHRs in Australia is currently unknown, and one of the criticisms of using such information is the potential for measurement error [4]. The aim of the current study was to estimate the reliability of electronic vaccination information in EHRs at general practices in Western Australia (WA).

2. Methods

At three general practices, one in rural WA and two in the Perth metropolitan area, we randomly selected 700 patients ≥ 18 years of age who had visited the practice during the influenza vaccination period of the preceding year (April to July 2014). Participating general practices used either Best Practice™ or Medical Director™, which are the practice management software packages used by the majority of general practices in Australia [5]. Selected patients were sent a letter from their general practice which described the study and outlined a mechanism for opting out. In February 2015, a contracted university survey research centre attempted to interview all patients who did not opt-out.

Abbreviations: CATI, computer-assisted telephone interview; EHR, electronic health record; ILI, influenza-like illness; WA, Western Australia.

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Consenting participants completed a five-minute Computer-Assisted Telephone Interview (CATI), which asked whether they received a seasonal influenza vaccination in 2014, whether they had certain medical conditions, and whether they experienced an influenza-like illness (ILI) in the previous year. Respondents were also requested to provide permission for us to verify this information in their electronic health record at the participating practice. For patients who agreed, data regarding 2014 seasonal influenza vaccination and the presence of specific medical conditions contained in the patient's EHR were extracted in March–April 2015.

To measure the reliability of general practice vaccination and medical information obtained through EHRs, we compared the degree of agreement between information extracted from patients' EHRs to self-reported information using Cohen's kappa coefficient (κ), interpreted in accordance with Altman's Kappa Benchmarking criteria [6]. To assess whether the proportion of patients who were vaccinated and the proportion of patients with medical conditions differed significantly when measured by EHR compared to self-report, we additionally performed McNemar tests for paired data. The Royal Australian College of General Practitioners defines a general practice's 'active' patients as those with three or more visits to the practice during the past two years [7]; we restricted our analyses to 'active' patients at the participating practices using these criteria as determined by records contained in the EHR.

This study was approved by the WA Health Human Research Ethics Committee (RA#2014.66).

3. Results

Of the initial 2100 potential participants, 182 (8.7%) opted out after receiving the invitation letter (Fig. 1). Of the remaining 1918 potential participants, 1310 (68.3%) were able to be contacted by telephone, of which 1201 (91.7%) patients completed the survey (81 declined participation, 18 could not remember key information, 6 respondents were unavailable, and four could not communicate in English). Of those who completed the survey, 1115 (92.8%) gave permission to verify their self-report with information contained in their EHR; 856 (76.8%) were considered 'active patients' at the practice and provided complete information on influenza vaccination and health conditions.

Of these active patients who provided complete information, based on self-report, 65.2% were women, 36.8% were 18–44 years of age, 35.7% were 45–64 years of age and 27.5% were 65 years or older. Two-in-five (39.4%) patients had one or more medical conditions of interest, and one-quarter (24.5%) of patients reported attending their general practitioner in the past year for an episode of ILI (Table 1).

3.1. Reliability of vaccination information

A total of 50.7% of patients self-reported receiving a seasonal influenza vaccine in 2014; a significantly lower percentage (36.9%) of patients had a record of seasonal influenza vaccination in 2014 documented in their EHR in 2014 ($p < .001$) (Table 2). Using Altman's Kappa Benchmark Scale, overall agreement between vaccination status determined by extraction of EHR information and self-report was "Good" (83.8%; κ : 0.68 [95% CI: 0.63–0.72]) (Table 2). Agreement on vaccination status was fairly consistent across patient age groups (range: 78.4% in 45–65 year olds to 87.6% in adults ≥ 65 years), for patients with chronic medical conditions (84.3%), and for patients who experienced an ILI requiring attendance to their general practitioner (87.4%) and patients who reported experiencing no ILI in the previous year (81.8%) (Table 2).

Almost half of the patients who reported being vaccinated in 2014, but for whom a record of vaccination could not be identified

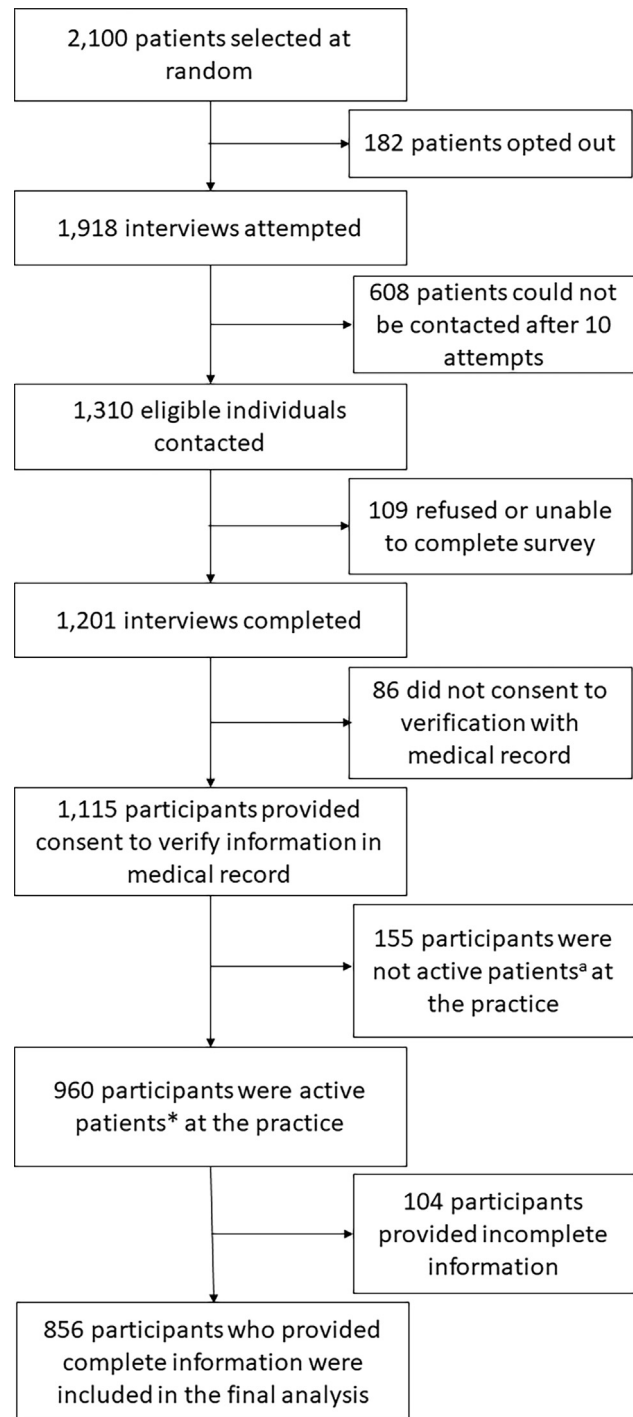


Fig. 1. Selection of general practice patients to participate in survey assessing the quality of electronic health and vaccination records – Western Australia, 2014. *Active patients were defined consistent with Royal Australian College of General Practitioners definition of ≥ 3 visits to the practice in the last two years.

in their EHR, indicated that they had been immunized through a workplace clinic (48.1%); another 26.5% reported they had been immunized by the participating general practice, 13.9% by a different general practice, 4.7% through a community immunization clinic, and 7.0% by some other immunization service provider.

3.2. Reliability of information on medical conditions

Agreement between the presence of a medical condition identified through the EHR and self-report was "Very Good" for diabetes

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