Immunising older Australians

Pre-COVID-19 associations of opportunistic immunisation in general practice registrar consultations

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Background and objective
Vaccine uptake in older Australians is suboptimal. This exploratory study aims to establish the associations of opportunistic older person immunisation in general practice registrars' practice.

Methods
This study was a cross-sectional analysis of data from the Registrar Clinical Encounters in Training (ReCEnT) study. Univariate and multivariable regressions explored associations between vaccine recommendations and patient, registrar, practice and consultation factors.

Results
A total of 2839 registrars provided data on 74,436 consultations. Associations of lower odds of immunisation included Aboriginal and Torres Strait Islander peoples (odds ratio [OR] 0.69; 95% confidence interval [CI]: 0.50, 0.96), rural/remote practice location (OR 0.75; 95% CI: 0.58, 0.98, compared with major cities) and in areas of greater relative socioeconomic disadvantage (OR per decile 1.03; 95% CI: 1.01, 1.05). Patients new to the practice (OR 2.46; 95% CI: 2.06, 2.94), or to the registrar (2.02; 95% CI: 1.87, 2.18) had higher odds of receiving an immunisation.

Discussion
Our findings suggest that general practice registrars may be proactively facilitating immunisation in new patients, but that inequities in vaccination persist.

IMMUNISATION is a key public health intervention. In the past, vaccine promotional efforts have largely focused on children, achieving 90–95% coverage in Australia.[1] Older adults, however, have received insufficient attention. The most recent Australian immunisation uptake data (2009) show that while influenza vaccine uptake has been stable, pneumococcal vaccine coverage has been falling. Only 51% of older Australians had received both vaccines.[2] These statistics indicate a significant gap between childhood and adult immunisation uptake.

There are many reasons for low uptake of immunisation in older age groups. Patient perceptions about disease severity, vaccine effectiveness and safety, and low provider confidence in adult vaccines are implicated.[2–4] Importantly, a health professional recommendation has been identified as the most important influence on patients' immunisation decisions.[3]

Given that immunisation is largely provided in primary care, general practitioners in training (registrars) are important for aged immunisation delivery. They comprise approximately 13% of the Australian general practice workforce by headcount[5,6] and are responsible for a significant proportion of immunisations delivered.

We aimed to establish the associations of a recommended vaccine being prescribed, or immunisation consultation provided, to older patients by Australian general practice registrars in their first 18 months in general practice. Our objective was to explore the context of registrars' opportunistic immunisation practices for older patients.

Methods

This was a cross-sectional analysis of data from the longitudinal Registrar Clinical Encounters in Training (ReCEnT) study.

ReCEnT

The full ReCEnT methodology has been described in detail elsewhere.[7] Briefly, ReCEnT is an ongoing prospective, multi-site educational and research cohort study of Australian general practice registrars.

It involves data collected once in each of registrars' three six-month training terms.[8]

Initial data collection includes registrar demographics and characteristics of their current teaching practice. The study encompasses general practices across all geographic locations, ranging from major cities to very remote regions.

Data from 60 consecutive clinical consultations are recorded via paper-based case report forms. Registrars record their data approximately midway through the term, aiming to reflect approximately one week of consultations. Only office-based consultations are included. Specialised clinics (including dedicated vaccination clinics) and home and residential aged care facility visits are excluded.

The in-consultation data reflect four main areas: patient demographics, diagnosis/problem managed, investigation/management (including medicines prescribed and administered) and educational aspects (whether in-consultation advice was sought, or learning goals generated).

To capture data consistent with immunisation guidelines for individuals defined as older age, analysis was restricted to non-Indigenous patients aged 65 years or over and Aboriginal and Torres Strait Islander patients aged 50 years or over.

Outcome factors

The outcome factor for this analysis was whether a recommended vaccine was prescribed, or an immunisation consultation provided. A recommended vaccine was defined as recommended in the Australian National Immunisation Program (NIP) or *Australian immunisation handbook* during the data collection period (2010–19). The reason that only these vaccines were included was to assess registrars' routine opportunistic vaccination practices consistent with immunisation guidelines rather than all patients seeking immunisation, for example, travellers (eg typhoid, yellow fever vaccines) or employees (eg Q fever; measles, mumps, rubella vaccines).

Recommended vaccines included influenza vaccine for all Aboriginal and Torres Strait Islander people aged ≥6 months and for non-Indigenous people aged ≥65 years; 23-valent pneumococcal polysaccharide vaccine (23PPV) for Aboriginal and Torres Strait Islander people aged ≥50 years and for non-Indigenous people aged ≥65 years; herpes zoster vaccine for people aged 70–79 years; and acellular diphtheria, tetanus and pertussis (DTPa) for people aged ≥65 years (if not received in the last 10 years). During the data collection period, a notable change to the Australian NIP schedule was the addition of the herpes zoster vaccine in 2016. Henceforth, references to immunisation will reflect this definition of a recommended vaccine.

Subsequent to the data collection period reported here, the pneumococcal vaccine transitioned from 23PPV to 13-valent pneumococcal conjugate vaccine (13PCV) in July 2020 and COVID-19 vaccines became available in March 2021. These vaccines were not included in the analysis.

Prescriptions for recommended vaccines were coded using the international Anatomical Therapeutic Chemical classification.[9] Consultation problems/diagnoses involving immunisation were coded according to the International Classification of Primary Care, second edition classification system (ICPC-2).[10]

Independent variables

The independent variables were related to patient, registrar, practice and consultation.

The patient factors included age group, gender, Aboriginal and Torres Strait Islander peoples, non-English speaking background and new patient to the practice/new patient to the registrar.

Registrar factors were age, gender, part-time or full-time status, training term, place of medical qualification (Australia or international), year of graduation and if the registrar had a previous health qualification.

The practice factors included size (number of general practitioners [GPs]), socioeconomic status of the practice location, level of rurality, if the practice routinely bulk-bills (no out-of-pocket expense to the patient), registrar training region and whether the registrar had worked in the practice in previous training terms. Rurality was defined using the Australian Standard Geographical Classification – Remoteness Area (ASGC-RA)[11] classification. The Socio-Economic Indexes for Areas – Index of Relative Socio-economic Disadvantage (SEIFA-IRSD)[12] was used to define the practice location's socioeconomic status. Practice postcode was used to assign ASGC-RA and SEIFA-IRSD classification for our analyses.

Consultation factors were duration, number of problems/diagnoses managed, if the registrar generated personal learning goals, or if the registrar sought in-consultation information or assistance.

Statistical analysis

This cross-sectional analysis was performed on 20 six-monthly rounds of data from 2010–19. Analysis was at the level of problem/diagnosis.

The proportion of problems/diagnoses for which vaccines were prescribed, or consultations were provided, regarding immunisation was calculated, with 95% confidence intervals (CI), adjusted for clustering (at the level of registrar).

Descriptive statistics included frequencies for categorical variables and mean with standard deviation for continuous variables. Further analyses used univariate and multivariable logistic regression.

Logistic regression was used within the generalised estimating equations (GEE) framework to account for repeated measures within registrars. We used GEEs for this purpose as our interest was in regression coefficients averaged across registrars, rather than registrar-specific coefficients, as would be provided by a mixed (random effects) model. For the GEEs, an exchangeable working correlation structure was assumed.

Univariate analyses were conducted on each covariate, with the outcome. Covariates with a univariate P value <0.20 were considered for inclusion in the multiple regression model.

Once the model with all significant covariates was fitted, model reduction was assessed. Covariates that were no longer significant (at $P<0.2$) in the multivariable model were tested for removal from the model. If the covariate's removal did not substantively change the resulting model, the covariate was removed from the final model. A substantive change to the model was defined as any covariate in the model having a change in the effect size (odds ratio) of >10%.

Diagnostic tests were conducted to assess goodness of fit: the Hosmer–Lemeshow (H-L) test, approximate linearity of continuous variables and influential observations. The H-L statistic tests the null hypothesis that the model is a good fit. If the *P* value ≥0.05 then there is no evidence to reject the null hypothesis and we assume that the model is a good fit. For large sample sizes, the H-L test can detect very small differences between observed and expected probabilities that can lead to a significant H-L *P* value. If the H-L test is significant (*P* <0.05), this indicates that the model may not be a good fit. In this case, other model assumptions were checked:

- Model assumptions of linearity for continuous variables were checked.
- Observed and expected probabilities were visually compared.
- Concordance statistics were checked (C-statistic, showing concordance between predicted and observed values) – the closer the value to 1, the better the fit.

If the model assumptions were met, this indicated that the significant H-L statistic was most likely caused by a large sample size and that there was no evidence that the model was not a good fit.

The regressions modelled the log-odds that a patient in the age group of interest was provided with a vaccine prescription or an immunisation consultation.

Analyses were programmed using STATA 16.0 and SAS V9.4.

Ethics approval

Ethics approval was obtained from University of Newcastle Human Research Ethics Committee (H-2009-0323).

Results

There were 74,436 eligible consultations and 130,188 problems from 2010–19 provided by 2839 registrars to Aboriginal and Torres Strait Islander patients aged 50 years or over and other non-Indigenous patients aged 65 years or over.

Of these problems, 6901 (5.3%) involved a vaccine prescription or immunisation consultation.

For registrar and practice characteristics, refer to Appendix 1 (available online only).

Associations of immunisation prescriptions and consultations

Characteristics associated with a recommended vaccine being prescribed or an immunisation consultation being provided are presented in Appendix 2 (available online only).

Multivariable analyses (Appendix 3; available online only) identified a number of variables significantly associated with immunisations prescriptions/consultations being provided. There was a lower odds of immunisation for Aboriginal and Torres Strait Islander patients (OR 0.69; 95% CI: 0.50, 0.96); those attending practices in outer regional, remote or very remote areas (OR 0.75; 95% CI: 0.58, 0.98 compared with major cities); and patients attending practices in areas of greater relative socioeconomic disadvantage (OR per SEIFA-IRSD decile 1.03; 95% CI: 1.01, 1.05). Patients who were new to the practice or to the registrar had higher odds of receiving a recommended immunisation with ORs of 2.46 (95% CI: 2.06, 2.94) and 2.02 (95% CI: 1.87, 2.18), respectively. Registrars in Terms 2 and 3 had lower odds, compared to Term 1, of providing immunisation (OR 0.23; 95% CI: 0.19, 0.27 and OR 0.74; 95% CI: 0.66, 0.84, respectively).

Other significant positive associations of immunisation were with younger patient age; patient male gender; smaller practice; registrar not seeking information or assistance, or not generating learning goals; and shorter consultation duration. There was also marked regional variability in immunisation.

Discussion

Summary of the main findings

We found that being from vulnerable populations (Aboriginal and Torres Strait Islander peoples, those living in rural environments and patients from lower socioeconomic areas) was associated with lower odds of receiving an immunisation.

Of note, patients new to the practice and/or the registrar had higher odds of receiving an immunisation. But we also found that the odds of providing immunisation were lower for more senior registrars.

Comparison with existing literature

We are unaware of any studies examining the immunisation practices of early-career GPs.

There are only a few Australian studies exploring the sociodemographic determinants of aged immunisation. However, findings from several international studies are comparable.

Similar to our findings, international studies demonstrated that older residents and those in lower socioeconomic areas, or with lower reported incomes, have lower rates of coverage with all four of the vaccines of interest.[13–18] In the literature, this finding was independent of whether the vaccines provided were fully, partly or not subsidised by the relevant government.

Regarding the lower odds of immunisation in patients attending rural practices, no Australian study has looked at the geographic distribution of aged immunisation. Studies conducted internationally have found conflicting results. Wershof Schwartz and colleagues showed that rural Israeli patients were less likely to be immunised against seasonal influenza than those living in urban areas.[19] On the other hand, studies in Iran and Taiwan found no association between geographic location and vaccine uptake.[17,20]

Patients identifying as Aboriginal and Torres Strait Islander peoples were also found to have a lower odds of immunisation in our study. Dyda and colleagues compared the influenza vaccine coverage between Aboriginal and non-Indigenous patients and, contrary to our findings, found for patients 65 years or older, uptake was similar.[21] For those aged 49–64 years, more Aboriginal people had received the vaccine. However, the absolute coverage remained low at 45%.[21] On the other hand, international studies looking at racial inequities of vaccine uptake found that older non-white patients had significantly lower rates of immunisation.[16,22,23]

Strengths and limitations

A strength of our study is the size of the ReCEnT dataset and the large number of independent variables recorded. This allows for fine-grained exploration of associations, adjusted for important potential confounders. The high response rate, together with a broad geographic footprint encompassing all levels of rurality and with a study population with demographics broadly representative of Australia's general practice registrar population, makes the findings generalisable to Australian GP training more broadly, though this generalisability is limited to office-based (not residential care) practice.

This study is the first to explore the immunisation prescribing and consultation practices of early-career GPs. It provides a novel insight into how aged immunisation is delivered and which patient groups may be comparatively under-immunised by our emerging GP workforce.

A limitation is that we cannot establish the prevalence of older patient immunisation as, in Australia, patients are able to access vaccines from other locations (eg employers and pharmacies). Also, dedicated immunisation clinics were excluded from data collection (as inclusion would compromise ReCEnT's educational utility). Furthermore, we do not have contextual information on patients' prior immunisation histories. Thus, we do not have a denominator of patients in need of vaccination at the index consultation.

Notably, the exclusion of dedicated immunisations clinics is also a strength as our study aim involved exploration of active engagement of general practice registrars in promoting preventive immunisation practice. This will include opportunistic immunisation initiated by the registrar.

As in any exploratory epidemiological study, and despite the large number of independent variables included in our analyses, there is potential for relevant variables not to have been measured, and for unmeasured confounding.

A final limitation is the seasonality of the influenza vaccination. Typically, Term 1 registrars commence their training in January of each year, which coincides with influenza vaccination delivery (this is not the case for all registrars, as some may commence in the second half of the year). Furthermore, approximately one-quarter of registrars work part time (Appendix 1; available online only), and there are other factors in registrars' training not being synchronous (eg maternity and other leave). Seasonality is a potential confounder; however, it does not fully explain the findings related to term.

Implications for general practice

Given that the immunisation uptake in older Australians is suboptimal and a recommendation from a health professional is a key factor influencing the decision to vaccinate, in-consultation opportunistic immunisation is an important component in achieving vaccine uptake in older patients.

Our findings suggest that general practice registrars may be particularly proactive in opportunistically pursuing immunisation in patients who are being seen for the first time at the practice, or for the first time by them personally. The reasons for these associations are complex and may be mediated by a number of factors (eg electronic medical record prompts, patient-initiated immunisation consultations or practice advertising). However, given the effect sizes we feel that there is evidence to suggest registrars are proactively immunising the elderly.

The caveat to this finding is that more-senior registrars appear to be less proactive in immunising older patients than Term 1 registrars. The implication for general practice is that GP vocational training programs should encourage maintenance of the motivation for opportunistic immunisation during later training terms (during which registrars typically have higher patient workloads). Training programs should also reinforce messages that opportunistic immunisation must particularly recognise the needs of vulnerable older populations.

The clinical practice implication of these data is that registrars (and by association GPs) need to be particularly mindful of the immunisation needs of vulnerable groups of older Australians (Aboriginal and Torres Strait Islander people and those living in rural/remote or lower socioeconomic backgrounds) during routine practice.

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