Appendix 2: Additional details relating to study methods

The report of top-level CareTrack Kids (CTK) results[1] and its associated online appendix detail the methods of the larger study, which generated the data reported in this paper. Selected methods specifically relevant to type 1 diabetes mellitus are described below.

Sample size

A visit was defined as an occasion of admitted care for inpatients, a presentation for Emergency Department (ED) care, or a consultation with a general practitioner or community-based pediatrician. Without adjustment for the design effect, a minimum of 400 visits per condition was required to obtain national estimates with 95% Confidence Interval (CI) and precision of +/- 5% at condition level, conservatively assuming only one assessable indicator per visit. It was anticipated that loss of precision due to design effects would be largely offset by multiple assessable indicators per visit and additional visits generated by secondary sampling (multiple visits for care of type 1 diabetes mellitus for each medical record identified for sampling of type 1 diabetes, and visits for care of type 1 diabetes incidentally found in medical records identified for sampling other conditions).

Sampling Process

A multistage stratified random sampling process was implemented. For logistical efficiency, sampling was targeted at three states, Queensland (QLD), New South Wales (NSW) and South Australia (SA), which together comprise 60.0% of the estimated Australian population aged 15 years or younger in the 2012 and 2013 calendar years. All six pediatric tertiary hospitals (two in QLD, three in NSW, and one in SA) were targeted as they have state-wide coverage. State Departments of Health organize care within administrative units ('health districts'): Hospital Health Services in QLD, Local Health Districts in NSW, and Local Health Networks in SA. For QLD, we targeted five health districts (two metropolitan, three regional), in NSW four health districts (two metropolitan, two regional), and in SA three health districts (two metropolitan, one regional). Despite best efforts, pediatricians were not recruited in targeted health districts in SA, so they were recruited in a metropolitan health district that was not randomly selected (the only other health district in the state).

Recruitment of health care providers

Within the selected health districts, we approached all public hospitals, or private hospitals providing public services under contract, that had patient volumes of ≥2,000 ED presentations and ≥500 pediatric separations per year; we also advertised the study to General Practices (GPs) and pediatricians, and approached all the providers we could identify through internet searches, and via personal contacts. Within the selected sites, we sampled medical records for each condition targeted at that setting.

As noted in the main text, 34 of 37 (92%) eligible hospitals that were approached agreed to participate. Recruitment of GPs and pediatricians was decentralized. Administrative details for refusal rates, from cold-calling or direct contact by clinicians who facilitated recruitment of their peers, were maintained on project laptops. At the end of recruitment all computers were decommissioned and cleaned, with the files archived on a USB. Unfortunately, the USBs created during laptop decommissioning were misplaced and have not been able to be located. This did not affect the indicator adherence data, as the database was remotely located and updated regularly via the internet. We have therefore sought to estimate the recruitment rates based on recruitment spreadsheets emailed to the administrative staff.

For GPs, we were only able to locate emailed spreadsheets with late stage records for one state, South Australia. Based on this spreadsheet, we approached 114 GPs and recruited 27 of them, giving a recruitment rate of 23.7%; an additional GP, not listed on the available spreadsheet, was recruited subsequently and was not added to either the numerator or the denominator, for this estimate. The spreadsheet did not have clear information on eligibility, so it is likely that an unknown number of the 114 approached were ineligible because: 1) they were not open during the whole 2012-2013 survey period; 2) they saw no or few children; or 3) they were not confident in their ability to generate full listings of children with the target conditions, or they did not use one of the four practice software systems our surveyors were trained to search. Our estimate of 23.7% is therefore likely to be an underestimate of the actual recruitment rate.

For pediatricians, we were fortunate to be able to locate emailed records with late stage records for all three states. Based on these spreadsheets, we successfully approached 80 eligible pediatricians and recruited 20 of them, giving a recruitment rate of 25.0%.

Self-selection of GPs and pediatricians, and the estimated 24-25% recruitment rate, could lead to bias in the estimated guideline adherence, arising from self-selection. It is plausible that self-selected practices were more confident of their guideline adherence, potentially leading to overestimation of guideline adherence in the CTK study.

Allocation of target samples to sites

The number of diabetes records targeted in each setting was determined by a nominal allocation of the 400 records targeted, informed by data available at the time, supplemented by expert opinion, with planned over-sampling of HCPs where fewer occasions of care were expected.[1,2] For hospitals, a fixed number was targeted at each site; for pediatricians, a fixed number was targeted initially, but this was abandoned as it was not possible to systematically identify patients by condition; for GPs, different combinations of conditions were targeted at each site, to simplify the logistics of sampling.

Data collection

Nine experienced pediatric nurses were employed across the three states, with all nine assessing occasions of care for diabetes. The surveyors undertook a one-week training program, prior to data collection. A surveyor manual was developed which included instructions, condition-specific definitions, inclusion and exclusion criteria, and guidance for assessing eligibility of each encounter for relevant indicators.

A web-based tool, originally developed for the CareTrack Adults study[3,4], was designed to enter data during medical record review. Algorithms to filter indicators by setting, and by age, were embedded in the tool. While there were no age-specific filters for Diabetes, many of the indicators were restricted to the hospital settings: for example, DIAB14, which assesses whether "*Children and adolescents with type 1 diabetes who presented with signs of diabetic ketoacidosis had their vital signs monitored*", was restricted to inpatient and ED settings.

Surveyors undertook criterion-based medical record reviews using the data collection tool. Surveyors assessed the record for evidence that the participant presented for management of type I diabetes in the years 2012 and 2013. The surveyors responded to each indicator as 'Yes' (care provided during the encounter was consistent with the indicator), 'No', or 'Not Applicable' (NA; the indicator was not eligible for assessment). For example, a surveyor assessing an ED presentation for management of a diabetic problem, without diabetic ketoacidosis, would record 'NA' to indicator DIAB14.

Analysis

Survey or register-derived data were used to estimate the proportion of occasions of care for type 1 diabetes .[5-12] The number of occasions of healthcare for each condition was thereby estimated for each hospital (inpatient and ED), each health district (GPs and most pediatricians) or each state (pediatricians in South Australia), and sampling fractions and weights were calculated using the methods detailed in eAppendix 4 of the broader CTK study (this Appendix can be accessed by request via the corresponding author, if required).[1]

A variety of stratifications, and sometimes domain analysis,[13,14] were necessary to ensure accuracy of the confidence interval estimates. These are detailed in eTable 2, below.

eTable 2: Domain analysis and stratifications for different estimates presented in the manuscript.

Location	Sub-section/Area	Domain analysis[13,14]	Strata
Table 2	Indicator estimates	Yes	State and healthcare setting
Table 3	Care type x strata estimates	Yes	Healthcare setting
	Care type estimates*	Yes	State and healthcare setting
Table 4	Care type x healthcare setting estimates	Yes	State
	Care type estimates*	Yes	State and healthcare setting

* This estimate is included in both Tables 3 and 4, for reader convenience.

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