Supplementary material S1 – Methods

We obtained dates of admission, discharge, dates of transfer from the first episode within a spell, details of the admission ward, discharge ward and, where relevant, second episode ward. We obtained the patients' age at admission, primary diagnosis ICD-10 code and, where relevant, date of death. Death follow-up data were available until 25 June 2019.

The data were analysed in the R statistical environment using the Tidyverse suite of packages. Graphs were drawn using the ggplot R software package (https://ggplot2.tidyverse.org/). In graphs of patient numbers, thin lines indicate counts and smoothed lines indicate predicted means derived using a LOESS smoothing function with default settings unless otherwise stated. The shaded area around these smooth lines indicates the 95% confidence interval of the predicted mean. This project was a retrospective service evaluation that was registered as a local quality improvement project with Oxford University Hospitals NHS Foundation Trust and as such was deemed not to require additional external ethical approval.

The whole dataset was first analysed for corrupted rows using the 'problem' function of the readr package in R, and corrupted rows and duplicate spells were removed. To restrict the analysis from after the opening of AEC and to avoid analysis of incomplete months, the dataset was pruned to include spells starting on or after 1 January 2016 and before 1 March 2019. Further pruning of the dataset included removal of any spells where the admit method was 'booked', 'planned', or 'waiting list' and where the first ward was not an adult medical admission, such as where the first ward was a paediatric ward. Within our dataset, it was not possible to determine the number of times that a patient attended AEC during a given spell and we therefore counted the overall length of spell and thus the number of zero-day (single visit with no overnight stay) spells. For the counts of length of spell, we excluded spells where patients were admitted or died during the spell.

To analyse the primary diagnoses, we used ICD-10 (International Statistical Classification of Diseases and Related Health Problems, 10th Revision) codes that were pruned to a three-digit level and analysed in R using the ICD-10 database within the package 'icd.data' (https://cran.r-project.org/web/packages/icd.data/index.html). Cancer primary diagnoses were analysed separately after all malignancy-associated ICD-10 codes were amalgamated into one group (ICD-10 codes beginning with 'C'). Data analysis was based on the primary diagnosis associated with the final discharge episode for any given spell. Readmission status was defined as readmission to an acute medical treatment function (as listed above) within 30 days of discharge.

We noted that spell data did not fully reflect readmissions for ambulatory patients because some patients had new planned spells. For heart failure and cellulitis, for example, we noted that patients were sometimes discharged to a hospital-at-home encounter, then electively brought back and discharged from AEC – creating a second spell. In the readmission analysis, we did not count as readmissions instances where a patient had another spell on AEC within 30 days and completed that spell purely under AEC. Towards the end of the study period, only spells with more than 30 days follow-up were analysed. We did not assess reattendances to the ED, non-medical specialties or primary care.

To calculate the admission rate for AEC patients, we arbitrarily amalgamated spells completed on AEC that occurred within 7 days of each other into a single spell to overcome the problem of undercounting the true admission rate due to some patients having multiple spells, as discussed above. We also removed from the analysis spells where the patient died during the index spell episode. At our institution, some medical patients are transferred to nursing home beds ('hub beds') funded by the hospital and technically remain under the care of the hospital. Transfer to one of these beds was not counted as an admission to medicine. Data for the admission rate include a comparison of EAU and AEC spells, since in both cases the patients can be discharged directly from the relevant assessment unit. We excluded the small number of medical patients who were admitted directly to an inpatient medical ward without coming through the EAU or AEC. We also did not have data on the number of ED patients who are reviewed by the medical service in the ED and discharged directly from the ED. In its first year of operation, the AEC could stay open overnight and keep up to six patients in 'flexi beds'. These overnight stay data are not available and are not reflected in the admission status for the first year of data analysis.

Mortality was assessed for the first spell for each patient only within the dataset. To calculate cumulative mortality, we used the survival package in R and plotted the results using the ggsurvplot function in the survminer R package. The survival time was calculated up to the last available mortality follow-up date of 25 June 2019. The 30-day mortality was calculated on a monthly basis as the percentage of spells in that month where the patient died within 30 days of the admission date for the spell.