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‘Virtual Ward’ community outreach support for COVID-19-positive dialysis patients may delay but not prevent subsequent admission to hospital: a single-centre retrospective case-control pilot study

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SARS-CoV-19 (COVID-19) has rapidly spread to become a global crisis since December 2019, disproportionately affecting haemodialysis (HD) cohorts who are unable to shield and frequently possess multiple risk factors for poorer outcome, including advanced age and multiple comorbidities (1,2). We and others have previously reported that regular screening of HD cohorts can detect asymptomatic infection and facilitate early cohorting away from non-infected patients (3,4). However, interventions to prevent subsequent deterioration and admission in COVID-19-positive HD cohorts are lacking. Interventions to reduce admission rates and to shorten admission length are desirable from a health service perspective to reduce pressure on inpatient beds; from a patient perspective shortened or avoided admission reduces the risk of deconditioning. HD cohorts are particularly at risk of this, due to the high prevalence of pre-existing co-morbidities such as sarcopenia, diabetes and cardiovascular disease (5).

A ‘virtual ward’ monitoring model was initiated at a large teaching hospital in the United Kingdom in November 2020 for all nasopharyngeal polymerase chain reaction (PCR) swab confirmed COVID-19 positive patients felt to be at risk of deterioration but not requiring admission (ambulant) at time of diagnosis. Symptomatic and asymptomatic COVID-positive patients receiving in-centre HD were provided with written information, an oxygen saturation probe and daily contact with an outreach nurse along with weekly remote assessment by a multidisciplinary team of nephrologists, microbiologists, nurses and acute physicians. Outreach nurses undertook face-to-face review of patients in the community if required. Transfer to hospital for medical assessment was triggered by a fall in oxygen saturation to below 94% or a new clinical concern.

We report here the outcomes of this intervention by retrospective comparison to a control COVID-positive HD cohort who were ambulant at diagnosis but were not managed through this pathway. Cases (prevalent COVID-positive HD patients referred to the outreach service) were matched on a 1:3 basis with controls by age (± 5 years) and sex, then by white/non-white ethnicity (where possible). Clinical data, including a history of comorbidities such as diabetes, documented lung disease or a history of cardiovascular disease, and recent (<30 days of positive swab) use of immunosuppression was collected.

The primary outcome was admission to hospital (an admission of ≥ 1 night) within 28 days of positive swab. Secondary outcomes were time from positive swab to first hospital admission and incidence of and time to death, both censored at 28 days and length of stay for those admitted. Categorical data (reported as percentage of group in cases then controls) was compared by chi-squared or Fisher's exact test and continuous data (reported as median (interquartile range) in cases then controls) compared by Mann-Whitney test. Survival curves were compared by log-rank test.

12 cases were matched to 35 controls, with one case matched to two controls. Cases were referred to the outreach pathway a median (IQR) of 4 (3–7) days after positive swab. The age range and gender distribution were similar between groups (72.5 (54–79) years, 67% male vs 72 (50–80) years, 60% male), as was ethnic make-up (25% vs 33% non-white). Cumulative time on HD therapy (2 (1-4) vs 3 (1-5) years, $P=0.23$) was similar between groups. In terms of comorbidities, the proportion with a past medical history of diabetes (42% vs 46%, $P=0.81$), documented lung disease (33% vs 25%, $P=0.44$), or recent immunosuppression use (8% vs 20%, $P=0.33$). A history of cardiovascular disease was more common in controls (69% vs 25%, $P=0.008$).

During the observation period, 42% of cases and 43% of controls were admitted to hospital. 28-day mortality was 9% in controls, with no deaths amongst cases. Figure 1 demonstrates the survival plots for admission to hospital (A) and overall survival (B) in the 28 days following COVID diagnosis. Whilst the overall proportion of patients admitted to hospital did not differ between groups, controls were admitted earlier than cases (8 (7–18) vs 4 (2–7) days after positive swab, $P=0.03$). Length of hospital stay was similar between groups (8 (6–10) vs 9 (5–20) days, $P=0.65$).

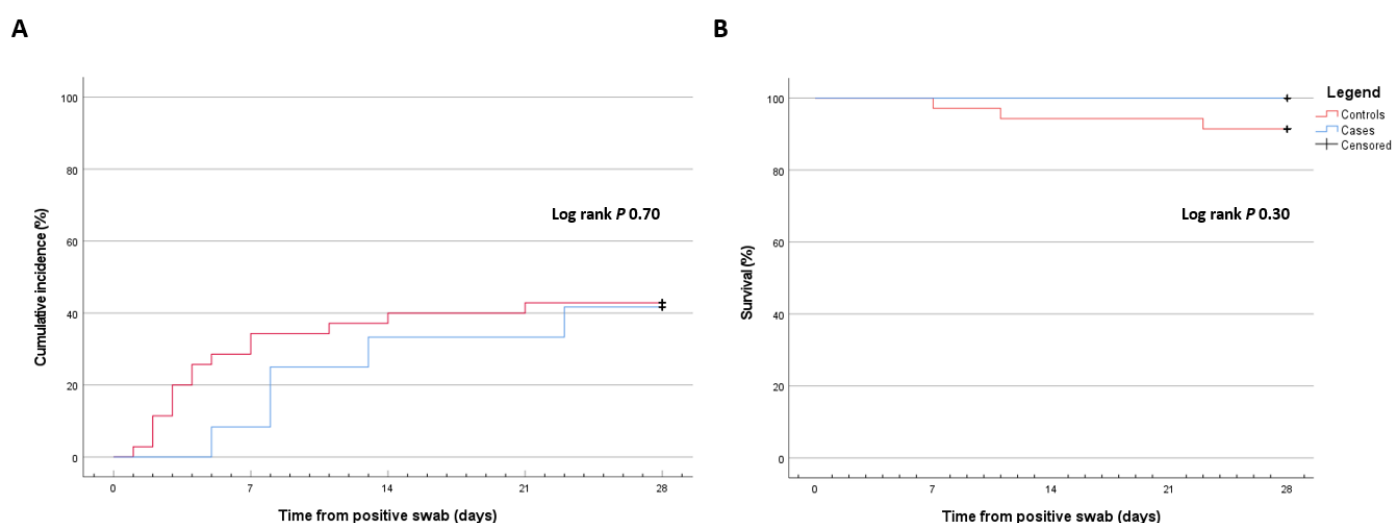


Figure 1: Survival curves showing (A) time from positive swab to admission and (B) survival from positive swab in cases and controls, censored at 28 days. Curves are compared using log rank test.

The COVID-19 crisis has accelerated the need for management pathways that reduce the burden of hospital admission whilst maintaining proper clinical management, follow up and escalation for patient cohorts at risk of deterioration.

Our findings indicate that community outreach management of COVID-positive HD patients may delay but not prevent subsequent admission to hospital, and does not impact upon length of stay or mortality. However, in patients who are ambulant and not requiring admission at time of COVID diagnosis overall mortality rates were significantly lower than those recently reported in a large European cohort, where 28-day mortality was around 30% (6).

The delay in admission in cases may represent the impact of nursing support at home to facilitate symptomatic management and reduce the likelihood of attendance in hospital whilst oxygen saturations remain adequate. We cannot exclude an impact due to immortal time bias in the delay between swab result and referral, especially given the apparent reduced prevalence of cardiovascular comorbidity in cases.

Our findings are important as ambulatory emergency care management is increasingly becoming the preferred option for acute care in the UK (7). In other settings, appropriate case selection and ambulant emergency management is associated with reduced length of stay, 30-day readmission rate and functional decline (8,9). To our knowledge we are the first to describe such a pathway for COVID-19-positive patients on renal replacement therapy and our findings are important not only for the current COVID pandemic but also for seasonal respiratory viruses such as influenza, where cohorts with advanced renal impairment demonstrate excess mortality (10).

This study has limitations. As a pilot scheme our case number is small, but we attempted to address this by matching to multiple controls per case. We used all-cause admission as a primary outcome as it is difficult to retrospectively judge whether recent COVID infection may have impacted upon an apparently independent admission (for example, fractured hip due to functional decline from recent COVID infection).

We recommend larger prospective studies are undertaken to confirm our findings, but suggest that alternative strategies to prevent hospital admission should be sought.

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