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Uptake of telehealth implementation for COPD patients in a high-poverty, inner-city environment: A survey

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Abstract

This study aimed to investigate computer and internet access and education attained in patients with chronic obstructive pulmonary disease (COPD) as potential barriers to implementation of telemedicine. We prospectively assessed 98 patients admitted with an acute exacerbation of COPD (mean age: 70.5 $\pm$ 9.3 years; force expired volume in the first second: 0.75 $\pm$ 0.39 L; 59% male) recording educational level attained and home computer and internet access. Hospital readmission surveillance occurred up to 2.7 (2.6–2.8) years following the index hospital admission. Only 16% of patients had a computer and only 14% had internet access; this group were younger and more educated than those without a computer. There was no difference in hospital readmissions over 2 years between those with and without access to a computer or internet. Only 12% of the whole cohort were educated to a school leaving age of 16 years and this group were more likely to be still working. School leaving age was directly associated with fewer hospital readmissions ($r = 0.251$, $p = 0.031$). In conclusion, these data highlight the current challenges to the widespread implementation of telehealth in COPD patients as there is limited availability of computer and internet access with such patients demonstrating a lower level of education achievement.

Keywords

Pulmonary disease, telemedicine, education, patient readmission, telehealth

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Chronic obstructive pulmonary disease (COPD) is a major driver of rising healthcare costs.[1] Telehealth is receiving increasing investment as a strategy with the goal of preventing hospital admissions and readmissions.[2] Recently, the TeleCRAFT trial[3] demonstrated that telemonitoring for patients with chronic respiratory disease did not delay time to next hospital admission, was associated with increased hospital admissions and did not improve patients' quality of life, with other trials reporting similar findings.[2,4] These publications are timely, given the current advancing care coordination and telehealth deployment (ACT) programme, which aims to

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Table 1. Demographics and clinical outcomes according to computer access and education.[a]

Variable	No access to computer ($n = 82$)	Access to computer ($n = 16$)	Incomplete education ($n = 81$)	Completed education ($n = 11$)
Age (years)	72 ± 9	64 ± 8	71 ± 9	68 ± 7
Male (%)	50 (60%)	8 (50%)	45 (55%)	7 (64%)
FEV_1 (litres)	0.78 ± 0.40	0.61 ± 0.30	0.71 ± 0.40	0.91 ± 0.26
BMI (kg/m^2)	24 (20–31)	25 (20–37)	24 (21–31)]	26 (19–35)
LTOT (%)	9 (11%)	3 (19%)	11 (14%)	1 (14%)
Home NIV (%)	1 (1%)	1 (6%)	2 (3%)	0
Exacerbation frequency (/12 months)	3 (2–4)	2 (2–3)	3 (2–4)	3 (2–5)
Hospital admission frequency (/12 months)	3 (1–4)	2 (2–3)	2 (1–3)	3 (2–5)
ED admission frequency (/12 months)	3 (2–4)	2 (2–4)	3 (2–3)	3 (2–5)
Smoking status				
Never smoker (%)	1 (1%)	0	0	1 (9%)
Current smoker (%)	34 (42%)	3 (19%)	28 (35%)	6 (55%)
Ex-smoker (%)	45 (56%)	13 (81%)	52 (65%)	4 (36%)
Smoking history (pack years)	40 (30–60)	45 (20–58)	40 (30–60)	40 (20–60)
Lives alone (%)	43 (54%)	7 (44%)	39 (48%)	8 (73%)
Employment status				
Working (%)	1 (1%)	2 (13%)	1 (1%)	2 (18%)
Retired (%)	73 (94%)	13 (81%)	75 (94%)	9 (82%)
Not employed (%)	4 (5%)	1 (6%)	4 (5%)	0
Independently mobile (%)	52 (63%)	14 (88%)	54 (67%)	9 (82%)
Use of walking aid (%)	33 (40%)	5 (31%)	35 (43%)	3 (27%)
Self-rated exercise tolerance (meters)	20 (10–50)	75 (43–100)	20 (10–50)	75 (18–125)
Previously attended PRP (%)	22 (27%)	11 (69%)	31 (38%)	2 (18%)
Computer (%)	0	16 (100%)	12 (15%)	4 (36%)
Internet access (%)	0	14 (88%)	10 (12%)	4 (36%)
Educated (%)	7 (9%)	4 (25%)	0	11 (100%)
Highest level of education obtained				
None (%)	69 (91%)	12 (75%)	81 (100%)	0
Standard (%)	2 (3%)	0	0	2 (18%)
School leaving certificate (%)	2 (3%)	1 (6%)	0	3 (27%)
O levels (%)	1 (1%)	0	0	1 (9%)
General certificate of education (%)	0	1 (6%)	0	1 (9%)
Higher education degree (%)	2 (3%)	2 (13%)	0	4 (36%)
School leaving age (years)	15 (14–15)	15 (15–16)	15 (14–15)	16 (15–18)
Depression-HADS on admission	7 ± 4	6 ± 4	7 ± 4	6 ± 4
Anxiety-HADS on admission	10 ± 5	8 ± 5	9 ± 5	11 ± 4
NRS on admission	4 ± 2	3 ± 2	4 ± 2	5 ± 2
CAT on admission	22 ± 11	23 ± 11	22 ± 11	24 ± 11
Hospital length of stay (days)	3 (2–7)	4 (2–5.5)	3.5 (2–7)	2 (1–5.5)
Required HDU during admission (%)	15 (18%)	2 (13%)	14 (17%)	2 (18%)
Required ITU during admission (%)	6 (7%)	0	6 (7%)	0

(continued)

Table 1. (continued)

Variable	No access to computer ($n = 82$)	Access to computer ($n = 16$)	Incomplete education ($n = 81$)	Completed education ($n = 11$)
In hospital death (%)	4 (5%)	0	3 (4%)	0
Readmissions within 28 days (%)	13 (18%)	1 (7%)	11 (15%)	3 (33%)
Hospital admissions during follow-up period	4 (2–10)	4 (1–6)	4 (2–10)	3 (0–5)

BMI: body mass index; CAT: chronic obstructive pulmonary disease assessment test; ED: emergency department; FEV_1: force expired volume in the first second; HADS: hospital anxiety and depression scale; HDU: high dependency unit; *n*: number; NIV: noninvasive ventilation; NRS: numerical rating scale – dyspnoea; PRP: pulmonary rehabilitation program; ITU: intensive care unit; LTOT: long-term oxygen therapy.
[a]Values are expressed as mean ± standard deviation, median (interquartile range) or *n* (%).

implement telehealth services in Europe.[5] Therefore, we investigated access to computer technology and the internet in a COPD cohort living in a high-poverty, inner-city environment. We hypothesized that COPD patients, who could potentially benefit most from a telehealth service in order to prevent hospital readmission, would have barriers to implementation such as limited access to technology.

Consecutive patients admitted with an acute exacerbation of COPD, between April and November 2013, to a London university teaching hospital servicing an inner city population in a high poverty area[6] were included. We assessed patients' home computer (desktop and/or laptop) and internet access and education attained. Hospital readmissions surveillance was performed in March 2016 (median 2.7 (2.6–2.8) years following initial hospital discharge). Post hoc analysis of data collected prospectively was performed. Descriptive data are reported as mean ± SD or median (interquartile range). As this was a clinical audit with all data anonymized, this project was registered with the local R&D department. Ethical approval was not required.

Ninety-eight patients were included (Table 1). The index hospital length of stay was 3 (2–7) days and the 28-day readmission rate was 16%. Over the period of follow-up, patients had a further 4 (2–10) hospital admissions. Only 16% of patients had a computer and 14% internet access (Table 1). Patients with a computer were younger (mean difference 8 (3–13) years, $p = 0.002$) with a greater number completing their schooling ($Z = -2.9$, $p = 0.004$) compared to those without a computer. However, there was no difference in hospital readmissions compared to those without a computer. Only 12% were educated to a school leaving age of 16 years. Those who were educated were more likely to be a smoker ($p = 0.008$) and still working ($p = 0.011$). A weak correlation was observed between school leaving age and hospital admission frequency ($r = 0.251$, $p = 0.031$).

These data demonstrate the low availability of home computer and internet access and the overall limited education attainment of our COPD patients. These findings challenge the potential efficiency, efficacy and benefit of the widespread deployment of the telehealth for patients with COPD at present.[5] Although the deployment of telehealth may be better served by the use of portable technologies, such as smart phones,[7] we did not measure this in the current study but hypothesise that ownership may be limited. Of interest, and probably reflecting the low socio-economic standing of these COPD patients, the access to computer and internet technology in this cohort is markedly lower than the general elderly population within the United Kingdom.[8] Finally, we observed a low level of educational achievement in this cohort, which raises concerns as to the ability of patients to comprehensively engage in a telehealth programme. We need to carefully consider the implementation of telehealth programmes in low-income areas within high-income countries as was demonstrated in the Whole System Demonstrator trial.[9] We must carefully consider the COPD target population that will benefit and the best time and mode of delivery of telehealth to ensure we successfully implement such a technology and avoid further failure.[3,4,10,11]

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