

Supplementary File

Table S1 Key Input Parameters of the Model

Input Parameter	Estimate
DEMAND	
Number of COPD exacerbation related arrivals to inpatient department	The Admission Model (i.e., Eq.1 presented in the manuscript)
Number of new COPD patients seen in COPD service (weekly)	Uniform (6-9)
Number of existing COPD patients (for Follow-up appointment) seen in the service (weekly)	Uniform (16-22)
Percentage of new patients having a first appointment in each clinic	COPD: 32% General: 46% NIV: 13% Alpha-1: 4% Advanced: 5%
Percentage of existing patients having a FU Appointment in each clinic	COPD: 13% General: 66% NIV: 11% Alpha-1: 8% Advanced: 1%
Percentage of patients falling into each gender	Male: 52% Female: 48%
Percentage of patients falling into each age group	25-44 years old: 5% 45-54 years old: 10% 55-64 years old: 30% 65-74 years old: 40% 75-84 years old: 10% 85+ years old: 5%
Percentage of patients falling into each disease severity	Mild: 10% Moderate: 40% Severe: 29% Very Severe: 21%
The capacity level for each clinic	COPD: Usual General: Usual NIV: Usual Alpha-1: Usual Advanced: Usual
OUTPATIENT DEPARTMENT	
Frequency of Clinic days	COPD: Once a week General: Once a week NIV: Once a week Alpha-1: Twice a week Advanced: Once a month
Attendance rate in each clinic	COPD: 75% General: 85% NIV: 85% Alpha-1: 95% Advanced: 95%
Appointment types for clinic visits, i.e., face to face or remote	See Table S2
Required mix of resources for Reception	F2F: A clerk and a desk Remote: none
Required mix of resources for Observation	F2F: An HCA and a room Remote: none
Required mix of resources for COPD and General Clinics	A consultant, an HCA, and a room

Required mix of resources for NIV Clinic	A consultant, an SV practitioner, an HCA, and a room
Required mix of resources for Alpha-1 Clinic	Two consultants, a HCA, a room, a scanner
Required mix of resources for Advanced Clinic	Two consultants, and an MDT, a room
Time spent in Reception per patient by appointment type (per patient)	F2F: Uniform (2-5 minutes) Remote: 0
Observation time in Observation room per patient by appointment type	F2F: Uniform (10-15 minutes) Remote: 0
Time spent in COPD Clinic and General Clinic (per patient)	FA: Uniform (30-45 minutes) FU: 15 minutes
Time spent in NIV Clinic and Alpha-1 Clinic (per patient)	FA: Uniform (30-45 minutes) FU: 20 minutes
Time spent in Advanced Clinic for First and FU appointments (per patient)	FA: 60 minutes FU: 20 minutes
Percentage of patients given a FU appointment in each clinic	COPD: 82% General: 100% NIV: 80% Alpha-1: 95% Advanced: 45%
Waiting time for the next FU appointment (i.e., when the patient will come back)	COPD: 6 months General: 6 months NIV: 6 months Alpha-1: 6 months Advanced: 12 months
The quality of a clinic visit as a face to face appointment	Worse than a usual appointment: 10% Same as a usual appointment: 70% Better than a usual appointment: 20%
The quality of a clinic visit as a remote appointment	Worse than a usual appointment: 68.8% Same as a usual appointment: 14.3% Better than a usual appointment: 17.1%
OUTPATIENT SERVICES	
Percentage of patients referred to Physiotherapy and Pulmonary Rehabilitation	Physiotherapy: 15% PR: 5%
Percentage of patients referred to LF testing	Benchmark: Between 40-45% Scenario 1: Between 15-20% Scenario 2: Between: 8-12% Scenario 3: Between 2-4%
Appointment types for Physiotherapy and Pulmonary Rehabilitation, i.e., face to face (centre-based) or remote (home-based)	Benchmark: 100% F2F Scenario 1: 25% F2F, 75% Remote Scenario 2: 15% F2F, 85% Remote Scenario 3: 0% F2F, 100% Remote
Appointment types for LF testing, i.e., face to face or remote	100% Face to Face, 0% Remote
The capacity level in Physiotherapy and Pulmonary Rehabilitation	Physiotherapy: Usual PR: Usual
The capacity level in LF Testing	Benchmark: 100% Scenario 1: 50-60% Scenario 2: 20-30% Scenario 3: 5-15%
Attendance rate for each service	LF Test: 90% Physiotherapy: 80% PR: 69%
Completion rate for Pulmonary Rehabilitation	42%
Required mix of resources for LF Test	A nurse and a room
Required mix of resources for Physiotherapy	A physiotherapist and a room

Required mix of resources for Pulmonary Rehabilitation	A physiotherapist, a nurse, a therapist assistant, a gym, and a classroom
Treatment time in each service	LF Test: 25 minutes Physiotherapy: Uniform (50-60 minutes) PR: Uniform (60-90 minutes)
Pre and Post assessment time in Pulmonary Rehabilitation (per patient)	Uniform (40-45 minutes)
Number of Pulmonary Rehabilitation sessions	16 sessions (2 sessions every week)
INPATIENT DEPARTMENT	
Length of stay in inpatient department	Frequency distribution (Average: 6.1 days)
Percentage of discharge method, i.e., Discharged to Community or PC, and Died.	Community or PC: 93% Died: 7%
PATIENT OUTCOMES	
QALY Gain due to PR	F2F (Centre-based): Uniform (0.029 – 0.032) Remote (Home-based): Uniform (0.037 – 0.040)
QALY Gain due to LF testing	Uniform (0.037 – 0.040)
QALY Reduction due to exacerbation related admission	Uniform (0.005 – 0.006)

Notes: Unless specified, the input estimates are the same for each scenario or all visit types. COPD: Chronic obstructive pulmonary disease, **FA:** First Attendance, **FU:** Follow-up, **F2F:** Face-to-face, **HCA:** Healthcare assistant, **LF:** Lung Function, **MDT:** Multidisciplinary Team, **NIV:** Non-Invasive Ventilation, **PC:** Primary Care, **PR:** Pulmonary Rehabilitation, **QALY:** Quality-adjusted life year, **SV:** Sleep & Ventilation.

Table S2 The parameter values of the scenarios

Month	Benchmark Scenario		Scenario 1 (Plan A)		Scenario 2 (Plan B)		Scenario 3 (Plan C)	
	SI	Appt. Type (F2F, Remote)	SI	Appt. Type (F2F, Remote)	SI	Appt. Type (F2F, Remote)	SI	Appt. Type (F2F, Remote)
Jan-22	0	100%, 0%	25	60%, 40%	40	40%, 60%	60	60%, 20%
Feb-22	0	100%, 0%	23	60%, 40%	40	40%, 60%	60	60%, 30%
Mar-22	0	100%, 0%	23	70%, 30%	40	50%, 50%	50	50%, 40%
Apr-22	0	100%, 0%	23	70%, 30%	35	50%, 50%	50	50%, 50%
May-22	0	100%, 0%	23	70%, 30%	35	50%, 50%	40	50%, 60%
Jun-22	0	100%, 0%	23	80%, 20%	35	60%, 40%	40	40%, 50%
Jul-22	0	100%, 0%	23	80%, 20%	23	60%, 40%	23	40%, 40%
Aug-22	0	100%, 0%	20	80%, 20%	20	60%, 40%	20	40%, 40%
Sep-22	0	100%, 0%	23	70%, 30%	23	50%, 50%	23	50%, 30%
Oct-22	0	100%, 0%	23	70%, 30%	35	50%, 50%	40	50%, 30%
Nov-22	0	100%, 0%	23	70%, 30%	40	50%, 50%	50	50%, 40%
Dec-22	0	100%, 0%	25	60%, 40%	40	40%, 60%	60	60%, 50%

Notes: Appt. Type: Appointment type, **F2F:** Face-to-face, **SI:** Stringency Index.