Report of the 2003 National COPD Audit

The Royal College of Physicians and the British Thoracic Society

September 2004

2003 NATIONAL COPD AUDIT

REPORT PREPARED BY

Dr Katharine Anstey
Project Coordinator (National COPD Audit), Clinical Effectiveness and Evaluation Unit, Royal College of Physicians

Mr Derek Lowe
Medical Statistician, Clinical Effectiveness and Evaluation Unit, Royal College of Physicians

Professor C Michael Roberts
Clinical Lead on the National COPD Audit, Consultant Respiratory Physician, Whipps Cross University Hospital.

Dr Harold Hosker
Second Clinical Lead on the National COPD Audit, Consultant Respiratory Physician, Airedale Hospital.

Contents

FOREWORD

The purpose of this audit is to help raise the standard of care for patients admitted to hospital with acute exacerbations of COPD.

We hope that this will be achieved in two ways. Firstly by providing comparative data on process of care and outcomes for individual sites against a benchmark of all other participating UK Trusts. Audits conducted in 1997 and 2001 by the British Thoracic Society and the Royal College of Physicians suggest large variations in the standards of care and outcomes between hospitals. Whilst some of this variability can be accounted for, much remains unexplained.

Secondly, it is hoped that a truly national audit will raise the profile of this condition providing an opportunity for hospital units to negotiate improved resourcing and organisation of care with health care purchasers. In order to facilitate this process comparative data on both available resources and the organisation of care of COPD patients for all participating sites is also included in this document.

Over 95% of acute secondary care Trusts admitting patients with COPD in England, Wales, Scotland and Northern Ireland took part in this audit. This makes it the largest audit of COPD ever conducted in the UK.

All possible safeguards to preserve the quality of data collected have been made by the CEEu. Nevertheless it is important to interpret your results in this report using your knowledge of your own service and any difficulties you experienced in collecting your audit data that may have biased your own outcomes. If you are aware of significant biases or inconsistencies in the reported data for your unit, please inform the CEEu as soon as possible (Katharine.Anstey@rcplondon.ac.uk).

To achieve change in COPD services requires the support of many different individuals and groups within the health services. We recommend that this report be circulated as widely as possible, and that an action plan be formulated with the agreement of all interested parties to plan improvements that may be needed to your service. We intend to produce regional reports and peer-reviewed papers that will be distributed nationally with the intention of raising the profile of COPD at the highest level.

We are grateful to everyone who has helped with the project and appreciate the very considerable amount of time and effort that has gone into obtaining local data. We hope that all participants will feel it has been worthwhile and that the audit represents a significant step in raising the profile of Chronic Obstructive Pulmonary Disease (COPD). Thanks are also due to the British Thoracic Society COPD Consortium for their financial support to the audit.

Katharine Anstey   Mike Roberts   Harold Hosker
Research Co-ordinator   Project Director   Project Director
June 2004

EXECUTIVE SUMMARY

The 2003 RCP/BTS audit of the hospital care of patients admitted with acute exacerbations of COPD is remarkable in that it is the first ever comprehensive national audit of this condition.

The aims of the audit were to provide a national benchmark against which individual Trusts might measure their own performance and secondly to identify aspects of the organisation and resourcing of care that are associated with better outcomes and performance. In this way Trusts may learn from each other and adopt strategies of care that should raise standards across the UK.

This initial report gives each hospital unit's results benchmarked against all 236 UK hospital units that completed the audit. It is intended that a second report will be produced that identifies specific organisation and resource issues that correlate with improved patient outcomes.

Participating Trusts supplied information on two separate aspects of COPD care. Firstly, resources and organisation of care available for acute COPD patients. Secondly, clinical data on 40 consecutive COPD admissions detailing both process of care, compared to national guidelines, and clinical outcomes. The audit was conducted between 1st September and 29th February 2004.

96% of all eligible Trusts (247 acute units from within 187 Trusts) registered to take part, and 236 hospital units returned data on the organisation of care and 234 on the process of care and clinical outcomes.

The headline findings of the audit were as follows:

Resources:
There was a wide variation in the resources available to manage COPD admissions as exemplified by the number of doctors available to treat such patients. 26% of units had ≤ 1 WTE respiratory medical consultant whereas 12% of units had 4 or more WTEs. The disparity between units was also evident in the numbers of general medical consultants, with an inter-quartile range of 8 -15 WTEs. There is increasing evidence from performance studies that hospitals with a high doctor to patient ratios have better outcomes.

Organisation of Care
A number of organisational factors were adopted by the majority of units:

89% of units had non-invasive ventilatory support available
88% of units had an admissions ward
82% of units had invasive ventilatory support available
82% of units had an HDU
65% of units had a specialist respiratory ward

64% of units had a formal pulmonary rehabilitation programme.
61% used an early warning detection system for critically ill patients.

Other factors were adopted by only a minority of units:

23% of units had an age-related admissions policy
33% of units used specialty triage
44% of units had some form of early discharge scheme for admission prevention or rapid discharge – most were nurse-led, daytime only schemes, running 5 days per week.

Clinical Data with Process of Care and Outcomes:
There were a total of 8013 admissions registered, referred to as cases, involving 7556 patients. 5% of patients were admitted twice in the audit. 53% were male, and mean age was 71 years. 97% had a white ethnic background. 64% had previously been admitted with a COPD exacerbation.

14% of all admissions entered an early discharge scheme.

The median length of stay for patients was 6 days. Units operating an early discharge scheme had a reduced median length of stay of 6 days compared to 7 days for units with no scheme.

30% of patients were admitted under a respiratory physician, but 47% were under a respiratory consultant on discharge from hospital suggesting a degree of specialty triage

Process of care also varied widely between hospitals with for example only 37% of patients with an arterial blood gas pH of <7.35 received ventilatory support, despite national guidelines recommending that all such patients should be considered for such support. The apparent failure to follow national guidelines is of concern and further analysis of these data will be reported in due course.

Outcomes:
Mortality was extremely high with 15% of all COPD patients dead within the 90 day follow up period. Variation between trusts was very wide (IQR 9-21%) and the effect of poor process of care organisation of care and resources available are likely to be critical in accounting for such variation.

The health economic burden of this condition is highlighted in the readmission rates recorded. 31% of all discharged patients had been readmitted to hospital within the same 90 day follow up period. This represents a major failure in discharge policy for this patient group. The IQR for units submitting data on 10 or more patients was 22-40%.

Food for Thought
This first ever UK national audit has demonstrated a very high acute mortality for this patient group with a very high readmission rate within 90 days of initial admission. Mortality rates, length of stay and readmission rates vary greatly between units as do available resources and organisation of care. Further analysis over the next few months should help us understand the relationship between these factors and provide a basis for national recommendations for the organisation and resourcing of care. Until that time individual units may wish to consider the quality of practice and process of care that they provide against their own organisation of care and resource allocation to this major healthcare issue.

Further information:
NICE guidelines on the management of COPD within the NHS in England and Wales are available from their website:
http://www.nice.org.uk/page.aspx?o=104441

BACKGROUND

Acute exacerbations of chronic obstructive pulmonary disease (COPD) are the second commonest cause of acute medical admission in the UK accounting for more than 10% of the total[1]. The resulting socio-economic burden of care is matched by the high death rate from this condition, which accounts for 5.6% of all male and 3.9% of all female deaths[2]. Many deaths occur during, or shortly after, hospital admission.

In 1997 the Royal College of Physicians (RCP) and the British Thoracic Society (BTS) jointly conducted a retrospective audit of the process of care and outcomes of acute hospital admissions with COPD. Forty-three centres across the UK contributed 1400 cases. Process was measured against BTS management guidelines[3] and outcomes of death, length of stay, and readmission rate were compared between units. This study was remarkable for demonstrating very wide variation in both process of care and outcomes that could not be accounted for by case-mix alone[4,5].

In 2001 a second RCP/BTS study was undertaken to assess the feasibility of conducting a larger national COPD audit and also to further examine outcomes and process of care. Thirty units in England and Wales used prospective case ascertainment and retrospective case-note audit of all their consecutive admissions in an 8 week period. They also completed a questionnaire about organisation of services and resources. The results confirmed the validity of the prognostic factors identified in the 1997 study and again highlighted wide variation in process of care and outcome between centres[6].

The 2003 national COPD audit from the RCP/BTS builds on the experience from the earlier studies and seeks to identify some of the resource and organisational factors that may account for the observed variations in patient outcome. This national comparative audit will also allow teams a national benchmark against which to compare themselves. The comparative performance data in this report should therefore provide a means of raising the standards of COPD care nationwide.

METHOD

Organisation and monitoring
The audit was run jointly by the Clinical Effectiveness and Evaluation unit (CEEu) of the Royal College of Physicians and by the British Thoracic Society. It was co-ordinated from the CEEu in London but employed local data collection in each unit using standardised methods. It had a multidisciplinary steering committee with representation from professional bodies and managerial organisations as well as policy makers (see Appendix 1 for a list of the membership). The steering group oversaw the preparation, conduct, analysis and reporting of the audit process.

Definition of 'unit'
The term 'unit' was used as the preferred term to describe the participating organisations. Where participation in the audit was as a Trust, the word 'unit' was taken to refer to their Trust. Where participation was as a hospital within a Trust, the word 'unit' was taken to refer only to that hospital. Participants were asked to define units in terms of the functionality of their Respiratory medicine Departments.

Throughout this report we shall refer to 'units' as the basis for analysis.

Recruitment
Invitations were sent in March 2003 to 578 hospital consultants in England, Wales, Scotland and Northern Ireland. These consultants were listed on the RCP database as having an interest in respiratory medicine. Letters were also sent to the Chief Executives of these Trusts to ask them to encourage their audit department to provide support for the audit. The letters contained a general information sheet about the audit, and the respiratory consultants were also sent a registration form and pre-paid reply envelope.

Cross-checking using the Department of Health list of acute Trusts for England and Wales by cluster and Binley's Directory of NHS Management for Scotland and Northern Ireland, revealed a further 4 eligible Trusts. The 4 Trusts who had been omitted from the original invitation were sent invitations to participate in June 2003.

Two reminder letters were sent to consultants at Trusts who did not respond to the invitation. Those who did not respond after 2 reminder letters were contacted individually by telephone by the project team to maximise participation in the audit.

Of the 193 Trusts eligible to take part, 187 registered to participate. Within these Trusts, each individual hospital with an acute admitting unit was encouraged to register as a separate site ('unit'). Overall 247 hospital units registered to take part. The main reasons given for sites declining to

participate in the audit or withdrawing from the audit were the associated problems of shortage of staff and lack of time in which to complete the data collection. Staff shortages and changes in personnel also affected the data collection and meant that some sites had problems meeting the prescribed deadlines.

Participating Trusts are listed in Appendix 2.

Development of the audit tool questions
Prior to the audit all respiratory consultants in England, Wales, Scotland and Northern Ireland were asked for their views on the content of the audit tool. This information was supplemented by a one-day workshop, which was held in February 2003 to further discuss items for inclusion. As a result two separate proformas were developed. The first to record clinical activity related to patient care and the second a survey or resources and organisation of care for acute COPD patients in each unit.
Pilot testing was done at five units in the North and East of England during May 2003 following which minor modifications were made to the audit tool.

Appendix 3 contains the final versions of the clinical and resources audit proformas.

Development of the software
Modevo Limited, an IT company based in Surrey was selected to develop the audit software after a competitive tendering process.

A prototype of the data collection tool was tested in the pilot of the national audit in May 2003. Further amendments were made following the steering committee meeting in June 2003. Final testing took place in July 2003, with the software being used by other members of the CEEu and by NHS units that had expressed an interest in seeing an early version of the audit tool.

The audit software was designed in the form of a self contained MS Access database. This was compatible with all versions of MS Access and could also be installed on computers that did not have MS Access software.

Data collection was via the clinical and resource questionnaires contained on the CD rom that was sent to participating units. 19 units collected the data on scannable paper forms due to technical difficulties.

Data collection
Units were able to choose the most appropriate personnel to complete the audit locally. A variety of different grades of staff completed the audit, including specialist registrars, respiratory nurses, audit department staff and data clerks.

The one-off resources questionnaire was completed by individual units between August and October 2003.

The clinical data collection took place between 1st September 2003 and 14th November. Anonymised audit data were requested for the first 40 patient admissions with an exacerbation of COPD. Cases involved in the audit were to be enrolled prospectively. This meant having to have some mechanism for identifying all the COPD cases admitted each day. Using knowledge gained from the previous audit it was suggested that a doctor or nurse could be allocated to phone all admitting teams each morning to identify patients, and for these to be logged for subsequent data collection from notes shortly after discharge. Other suggestions were to use the A&E (or acute admissions ward) admissions book. The Patient Administration System or similar could also be used to cross-check the capture of all COPD cases.

The last section of the clinical proforma asked for details of patient outcome data, at 90 days after their admission.

The data collection was supported by helpnote manuals that were sent to clinical leads and audit coordinators. The helpnotes were also embedded within the audit software alongside the relevant audit questions. A helpdesk was maintained at the Royal College of Physicians for the duration of the audit, and this was supplemented by frequently asked questions pages on the Royal College of Physicians website and by regular newsletters.

Data collation and analysis
Completed audit profomas were sent by post or by email to the Royal College of Physicians for collation and analysis.

A number of consistency checks built into the electronic software helped to reduce typographical errors in data inputting and improve the quality of the data. Consistency checks were carried out at the Royal College of Physicians.

The respiratory consultants leading the audit at the RCP identified key fields where data completeness was particularly important. These were mainly the resources data items that would be used in later analyses to interpret the variation in patient outcome data. Units were asked to complete any shortfalls and resolve any inconsistencies.

Reliability
In order to gain a measure of the reliability of the data submitted, units were asked to identify a second individual to re-enter clinical data on the first 5 patients included in the audit. It was stressed that this re-entry should be done without reference to the data that was collected and entered by the first auditor. 190 units submitted 910 cases for analysis. The levels of reliability were generally good with kappa values of 0.60 and higher dominating the results. Most were over 0.80 (very good). There are no data items against

which we would issue a 'health warning'. For further details of the reliability analyses please see Appendix 4

Presentation of results
The presentation of results is primarily comparative, using the national figures as the comparator. For key results the variation between units is summarised by their median and inter-quartile range (IQR) and shown graphically by histograms.

RESULTS OF THE RESOURCES AUDIT

Organisational Data were received from 236 units within 180 Trusts. These included 133 Trusts who participated in the audit as a Trust, for whom 'unit' refers to their Trust. Other 'units' participated as one of several hospitals within their Trust – there were 40 Trusts with two 'units', 5 Trusts with three 'units' and 2 Trusts with four 'units'.

Catchment populations, number of COPD patients and Bed Occupancy for 2002

Catchment population of Trust .

		National (180 Trusts)	Your unit
Unit returns	Median	278000	**310000**
	IQR	202000 - 360000	

COPD patients admitted by unit in 2002

		National (228/236 units)	Your unit
Unit returns	Median	458	**548**
	IQR	312 – 716	

Medical bed occupancy rate of unit in 2002

		National (213/236 units)	Your unit
Unit returns	Median	95%	**100**
	IQR	91 – 98	

STAFFING: Whole Time Equivalents (WTE)

Staff members within the unit

Some units did not respond to all aspects – consequently the denominators varied from 227-236.

There was wide variation in the resources available to manage COPD admissions as exemplified by the number of doctors available to treat such patients. 26% of units had ≤ 1 WTE respiratory medical consultant whereas 12% of units had 4 or more WTEs. The disparity between units was also evident in the numbers of general medical consultants, with an inter-quartile range of 8 -15 WTEs.

Staff members (WTE) for Respiratory medicine: %

RESPIRATORY MEDICINE	National audit : % of units with					Median (WTE)	Your unit
	NO WTE	0.1 to 1.0 WTE	1.1 to 2.0 WTE	2.1 to 3.0 WTE	> 3.0 WTE		
Consultants	7	19	43	17	14	2	**3.0**
Associate Specialists	90	10	0.4	-	-	0	**0.0**
Staff Grades	79	19	2	0.4	-	0	**0.0**
SpR	32	40	17	4	7	1	**2.5**
Trust Grade SpR	87	11	1	-	-	0	**0.5**
SHO	22	27	29	11	11	2	**1.0**
Trust Grade SHO	82	15	2	0.4	1	0	**0.0**
PRHO	24	33	30	6	6	1	**4.0**
Lung Function Technicians	14	32	21	15	18	1.5	**1.8**
COPD Nurses	42	24	17	12	5	1	**0.5**
Other specialist respiratory nurses	13	37	26	14	10	1	**4.8**
Specialist respiratory physiotherapists	33	43	17	4	3	1	**1.0**

Staff members (WTE) for General Medicine: %

GENERAL MEDICINE	National audit: % of units with					Median (WTE)	Your unit
	NO WTE	0.1 to 1.0 WTE	1.1 to 5.0 WTE	5.1 to 10.0 WTE	>10.0 WTE		
Consultants	-	1	10	32	57	12	**14.0**
Associate Specialists	73	19	8	-	-	0	**0.0**
Staff Grades	39	23	30	7	1	1	**0.0**
SpR	8	9	40	32	10	5	**8.5**
Trust Grade SpR	75	10	12	2	1	0	**1.0**
SHO	3	2	7	33	54	11	**20.0**
Trust Grade SHO	50	14	26	7	3	0	**0.0**
PRHO	4	1	18	57	20	8	**14.0**

Staff members (WTE) available during the daytime in the first 24 hours to treat acute COPD patients

Some units did not respond to all aspects – consequently the denominators varied from 199-217.

Staff members (WTE) for Respiratory medicine: %

RESPIRATORY MEDICINE	National audit: % of units with					Median (WTE)	**Your unit**
	NO WTE	0.1 to 1.0 WTE	1.1 to 2.0 WTE	2.1 to 3.0 WTE	> 3.0 WTE		
Consultants	53	22	15	6	4	0	**0.0**
Associate Specialists	97	3	-	-	-	0	**0.0**
Staff Grades	95	5	-	0.5	-	0	**0.0**
SpR	67	25	6	1	1	0	**0.0**
Trust Grade SpR	96	4	-	-	-	0	**0.0**
SHO	62	17	13	5	3	0	**0.0**
Trust Grade SHO	95	5	-	-	-	0	**0.0**
PRHO	66	20	12	2	0.5	0	**0.0**
Lung Function Technicians	57	18	9	7	9	0	**0.0**
COPD Nurses	57	23	11	7	2	0	**0.0**
Other specialist respiratory nurses	56	27	11	4	2	0	**0.0**
Specialist respiratory physiotherapists	56	33	7	2	1	0	**0.0**

Staff members (WTE) for General Medicine: %

GENERAL MEDICINE	National audit: % of units with					Median (WTE)	**Your unit**
	NO WTE	0.1 to 1.0 WTE	1.1 to 2.0 WTE	2.1 to 3.0 WTE	> 3.0 WTE		
Consultants	3	60	14	1	22	1	**2.0**
Associate Specialists	94	6	1	-	-	0	**0.0**
Staff Grades	75	16	3	2	4	0	**0.0**
SpR	18	61	6	4	11	1	**1.0**
Trust Grade SpR	91	5	1	2	1	0	**0.5**
SHO	3	28	34	10	25	2	**2.0**
Trust Grade SHO	76	15	5	1	2	0	**1.0**
PRHO	6	51	18	3	20	1	**1.0**

ORGANISATION

Work patterns used for each grade of staff.

We asked for work patterns used by staff in each department on call for acute medical emergencies.

Work patterns for staff in Respiratory medicine: %

RESPIRATORY MEDICINE	Stated	National Audit (236): % of stated					**Your Unit**
		% On Call Rota	% Partial Shift	% Full Shift	% Hybrid Shift	% Don't Know	
SpR	86	45	14	20	8	13	
SHO	86	10	24	35	15	15	
PRHO	84	20	25	32	7	15	

Work patterns for staff in General Medicine: %

GENERAL MEDICINE	Stated	National Audit (236): % of stated					**Your Unit**
		% On Call Rota	% Partial Shift	% Full Shift	% Hybrid Shift	% Don't Know	
SpR	213	42	22	25	8	3	**Partial**
SHO	235	10	27	49	12	1	**Full**
PRHO	232	16	25	46	10	3	**On Call**

Work patterns for staff in Care of the Elderly: %

CARE OF ELDERLY	Stated	National Audit (236): % of stated					**Your Unit**
		% On Call Rota	% Partial Shift	% Full Shift	% Hybrid Shift	% Don't Know	
SpR	128	41	13	24	8	14	
SHO	139	13	24	42	11	10	**Full**
PRHO	124	16	24	38	9	13	

Post-take ward rounds undertaken by a consultant each day: % (n)

National audit (236)			Your unit
One	Two	Other	
40 (95)	57 (135)	3 (6)	**Two**

Physician of the week scheme used in unit: % (n)

National audit (236)		Your unit
Yes	No	
12 (28)	88 (208)	**No**

Ward-based system used in unit: % (n)

National audit (236)			Your unit
Yes	No	Don't Know	
59 (140)	40 (95)	(1)	**Yes**

Specialty triage used in unit: % (n)

National audit (236)		Your unit
Yes	No	
33 (78)	67 (158)	**No**

Type of written admissions policy: % (n)

National audit (236)			Your unit
Age related	Integrated	Don't know*	
23 (54)	53 (124)	25 (58)	**Age related**

*These comprise 26 who said 'don't know' and 32 who left this question blank.

Age cut-off for units with an age-related admissions policy:

Age cut-off	Units
60	1
65	5
70	1
74	2
75	19
76	1
77	4
78	7
79	1
80	9
85	4
Your Unit:	**80 yrs**

RESOURCES

How many accident and emergency departments does unit have: % (n)

National audit (236)			Your unit
None	One	Two	
5 (11)	94 (223)	1 (2)	**One**

Does unit have an admissions ward: % (n)

National audit (236)		Your unit
Yes	No	
88 (208)	12 (28)	**Yes**

Does unit have a specialist respiratory ward: % (n)

National audit (236)		Your unit
Yes	No	
65 (154)	35 (82)	**Yes**

Type of HDU that unit has: % (n)

National audit (236)				Your unit
Medical	Mixed	Other	No HDU	
11 (25)	64 (152)	7 (16)	18 (43)	**No HDU**

Number of operational ICU beds that unit has:

National audit (236)		Your unit
Median (ICU beds)	Inter-Quartile Range (ICU beds)	
6	5-8	**7**

13 units said they had no ICU operational beds.

Does unit use a system of early warning detection or ICU outreach for critically ill cases requiring ICU management: % (n)

National audit (236)			Your unit
Yes	No	Don't Know	
61 (145)	38 (89)	1 (2)	**No**

Methods of ventilatory support used in unit: % (n)

Method	National audit (236)		Your unit
Invasive	82	(193)	**Invasive**
Doxapram	55	(130)	**Doxapram**
Nasal CPAP	42	(98)	**Nasal CPAP**
Non-invasive BiPAP/NIPPV	89	(209)	**Non-invasive**

Availability of non-invasive ventilation: % (n)

	National audit (236)		Your unit
On ICU	60	(142)	**ICU**
On HDU	63	(148)	**-**
On wards	63	(149)	**Wards**

Which patients have access to a respiratory nurse: % (n)

	National audit (236)		Your unit
All COPD patients	72	(169)	
Some- only those admitted under respiratory consultant	5	(12)	**Some - other**
Some - other	14	(34)	
None / No respiratory nurse	9	(21)	

Does unit have a formal pulmonary rehabilitation programme: % (n)

National audit (236)		Your unit
Yes	No	**Your unit**
64 (151)	36 (85)	**Yes**

EARLY DISCHARGE SCHEME

Do patients coming to unit with an exacerbation of COPD have access to an early discharge scheme: % (n)

National audit (236)		Your unit
Yes	No	
44 (104)	55 (132)	No

What is the scheme for: % (n)

National audit (104/236)					Your unit
Admission prevention	Rapid discharge <48hrs	Assisted discharge >48hrs	Other*	Don't know	
5 (5)	26 (27)	24 (25)	43 (45)	2 (2)	

*other was known for 11 of the 45 cases – all 11 of these gave all three reasons.

How many COPD patients from the unit were accepted by an early discharge scheme in the last 12 months:

National audit (104/236)			Your unit
% Known	Median (patients)	Inter-Quartile Range (patients)	
80 (83/104)	112	63-216	

How many hours per day does scheme run: % (n)

National audit (104/236)				Your unit
7-8 hours	9-12 hours	>12 hours	Don't know	
65 (68)	18 (19)	10 (11)	6 (6)	

How many days per week does scheme run: % (n)

National audit (104/236)				Your unit
5 days	7 days	Other	Don't know	
63 (66)	28 (29)	8 (8)	1 (1)	

PATIENT DATA: ADMISSION EPISODES

Patient Data were received from 234 units within 180 Trusts. These included 133 Trusts who participated in the audit as a Trust, for whom 'unit' refers to their Trust. Other 'units' participated as one of several hospitals within their Trust – there were 39 Trusts with two 'units', 5 Trusts with three 'units' and 2 Trusts with four 'units'.

8013 admissions (episodes) from 7556 patients were available for analysis. 407 patients (5%) with 2 or more exacerbations were included in the audit more than once. A very small number of duplicate admission episodes however were excluded. The median number of admissions per unit was 39, inter-quartile range 30-40, range 1-42. 58% were admissions during September 2003, 36% during October 2003, 6% during November 2003, and 0.1% during December 2003.

You contributed **41** admissions from **38** patients to the analyses.

Patient proforma completed by: % (n)

	National audit (8013 episodes)	
Known for:	94%	(7543)
If known		
Nurse	22	(1685)
SpR	26	(1980)
SHO	15	(1239)
Audit staff	25	(1901)
Other	19	(1419)

DEMOGRAPHICS AND DISEASE SEVERITY

Gender: % (n)

	National audit (8013 episodes)		Your Unit (41)	
Males	53	(4210)	**61**	**(25)**
Females	47	(3797)	**39**	**(16)**
Don't know		(6)		**(0)**

Age: % (n)

	National audit (8013 episodes)		Your Unit (41)	
<65 yrs	24	(1921)	**17**	**(7)**
65-74 yrs	36	(2879)	**32**	**(13)**
75-84 yrs	33	(2605)	**41**	**(17)**
85+ yrs	7	(597)	**10**	**(4)**
Don't know		(11)		**(0)**
Mean (SD) age	71 yrs	(10 yrs)	**72**	**(10)**

Males: mean 72 yrs (SD10 yrs), Females: mean 71 yrs (SD 10 yrs).

Age in years
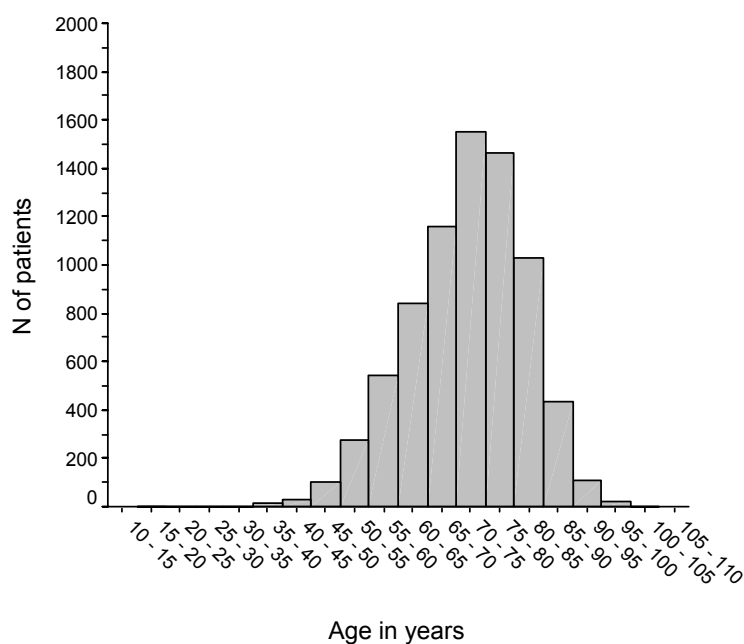
Ethnicity: % (n)

	National audit (8013 episodes)		Your Unit (41)	
Ethnicity known	80	(6399)	**54**	**(22)**
If recorded:				
White	97.3	(6224)		**(19)**
Asian or Asian British	0.9	(57)		**(1)**
Black or Black British	0.4	(28)		**(0)**
Chinese	0.1	(5)		**(0)**
Mixed	1.0	(67)		**(0)**
Other Ethnic Group	0.3	(18)		**(2)**

Before this audit, was patient previously admitted to hospital for COPD, or accepted by an early discharge scheme for COPD: % (n)

	National audit (8013 episodes)		Your Unit (41)	
Yes	64	(5114)	**46**	**(19)**
No	31	(2468)	**34**	**(14)**
Don't know	5	(431)	**20**	**(8)**

Previous admission rate for UNIT: %
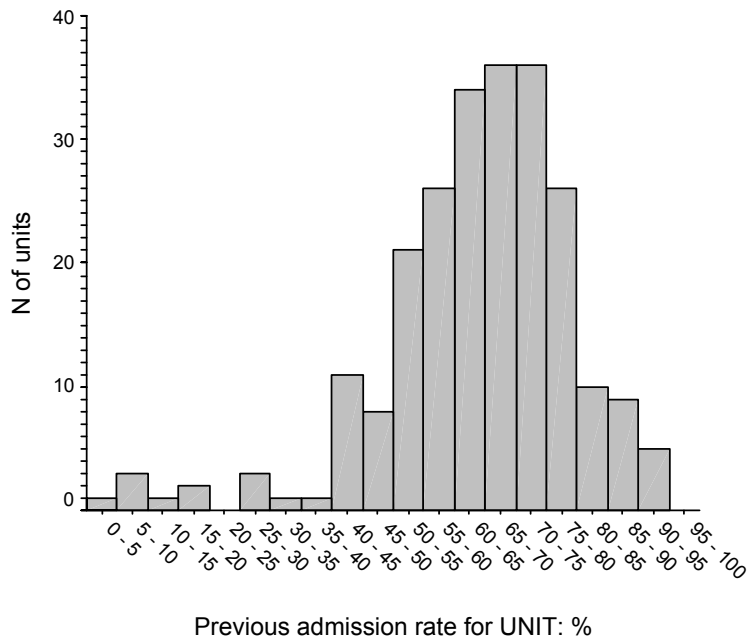
Social circumstances: % (n)

	National audit (8013 episodes)		Your Unit (41)	
Lives alone	36	(2923)	**20**	**(8)**
Lives with others	58	(4627)	**59**	**(24)**
Don't know	6	(463)	**22**	**(9)**

Other social circumstances: % (n)

	National audit (8013 episodes)		Your Unit (41)	
Lives in own home without social care	57	(4591)	**59**	**(24)**
Lives in own home with social care	14	(1157)	**5**	**(2)**
Warden controlled (sheltered housing)	6	(441)	**2**	**(1)**
Residential or nursing home	4	(323)	**5**	**(2)**
Other	2	(125)	**5**	**(2)**
Don't know	17	(1376)	**24**	**(10)**

Performance status: % (n)

	National audit (8013 episodes)		Your Unit (41)	
Normal activity	10	(801)	**5**	**(2)**
Strenuous activity limited	17	(1332)	**17**	**(7)**
Limited activity but self care	41	(3275)	**41**	**(17)**
Limited self care	18	(1407)	**12**	**(5)**
Bed or chair bound – no self care	3	(255)	**5**	**(2)**
Don't know	12	(943)	**20**	**(8)**

UNIT % limited self-care or bed/chair bound
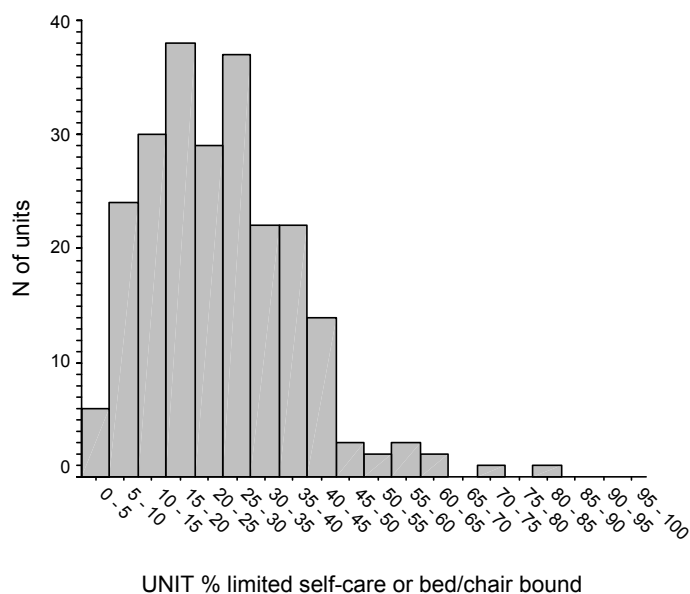
The % in the graphic exclude the don't know cases. **Your unit: 21%**

Any other significant medical conditions: % (n)

	National audit (8013 episodes)		Your Unit (41)	
YES, Other significant medical conditions	72	(5762)	**59**	**(24)**
Specifically:-				
Heart disease	38	(3017)	**37**	**(15)**
Stroke	6	(452)	**0**	**(0)**
Other chest problems	11	(889)	**2**	**(1)**
Diabetes	10	(778)	**5**	**(2)**
Locomotor problems	12	(964)	**7**	**(3)**
Visual impairment	3	(239)	**2**	**(1)**
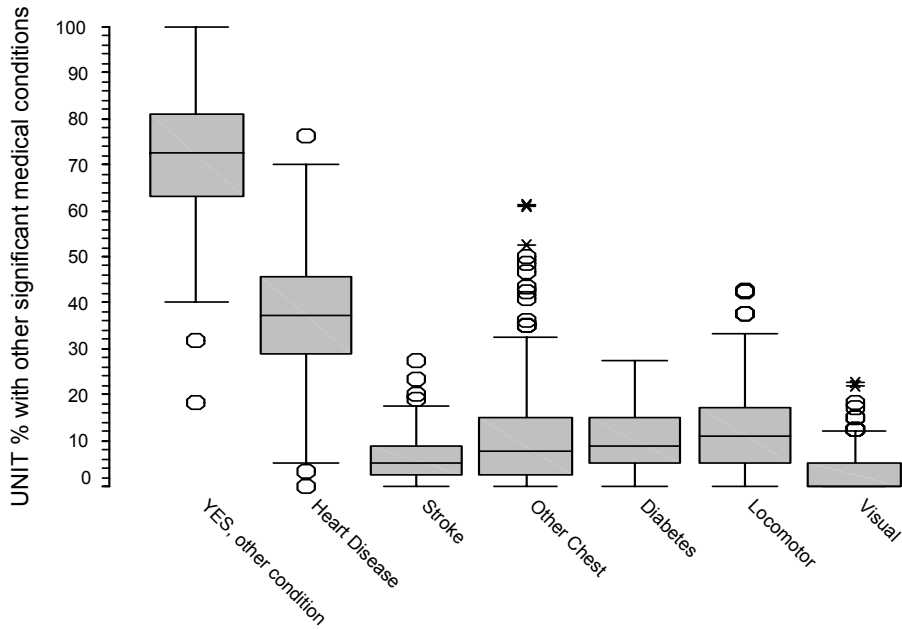
Smoking status: % (n)

	National audit (8013 episodes)		Your Unit (41)	
Current smoker	39	(3137)	**34**	**(14)**
Ex-smoker (stopped > 3 months)	52	(4194)	**44**	**(18)**
Life long non-smoker	4	(292)	**0**	**(0)**
Don't know	5	(390)	**22**	**(9)**

57% (1803) of current smokers had had a previous admission for COPD.
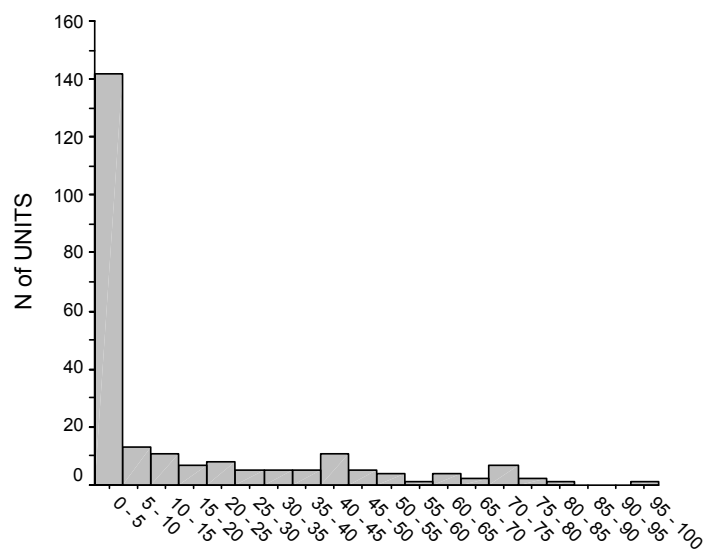
Pack years of smoking: % (n)

Pack year data available for 46% (3408) of current and ex-smokers.

Pack years	National audit (3408 episodes)		Your Unit (11)	
<20	9	(301)	**0**	**(0)**
20-39	31	(1047)	**45**	**(5)**
40-59	35	(1193)	**18**	**(2)**
60+	25	(867)	**36**	**(4)**

ADMISSION

Was patient accepted by early discharge (or hospital at home) scheme: % (n)

	National audit (8013 episodes)		Your Unit (41)	
Yes	14	(1125)	**0**	**(0)**
No	81	(6529)	**85**	**(35)**
Don't know	4	(359)	**15**	**(6)**

UNIT % cases accepted by early discharge scheme

What was acceptance to scheme for: % (n)

	National audit (1125 episodes)		Your Unit (0)	
Admission prevention	4	(47)		**(0)**
Rapid discharge <48 hours	25	(286)		**(0)**
Assisted discharge >48 hours	64	(716)		**(0)**
Other	4	(46)		**(0)**
Don't know	3	(30)		**(0)**

If admitted as an inpatient who was patient admitted under: % (n)

	National audit (8013 episodes)		Your Unit (41)	
Respiratory physician	30	(2369)	**29**	**(12)**
Care of the elderly physician	16	(1261)	**17**	**(7)**
General physician	49	(3955)	**37**	**(15)**
Other	3	(258)	**2**	**(1)**
Don't know	2	(170)	**15**	**(6)**

Patient transferred from another hospital: % (n)

	National audit (8013 episodes)		Your Unit (41)	
Yes	1	(101)	**2**	**(1)**
No	97	(7747)	**88**	**(36)**
Don't know	2	(165)	**10**	**(4)**

LENGTH OF STAY

LOS in hospital: % (n)

	National audit (7741/8013 episodes)		Your Unit (36)
0-3 days	26	(1990)	**25**
4-7 days	33	(2583)	**28**
8-14 days	25	(1925)	**25**
15+ days	16	(1243)	**22**
Median (IQR) LOS	6 days	(3-11)	**Median: 7 days**

Median LOS (days in hospital) for UNIT
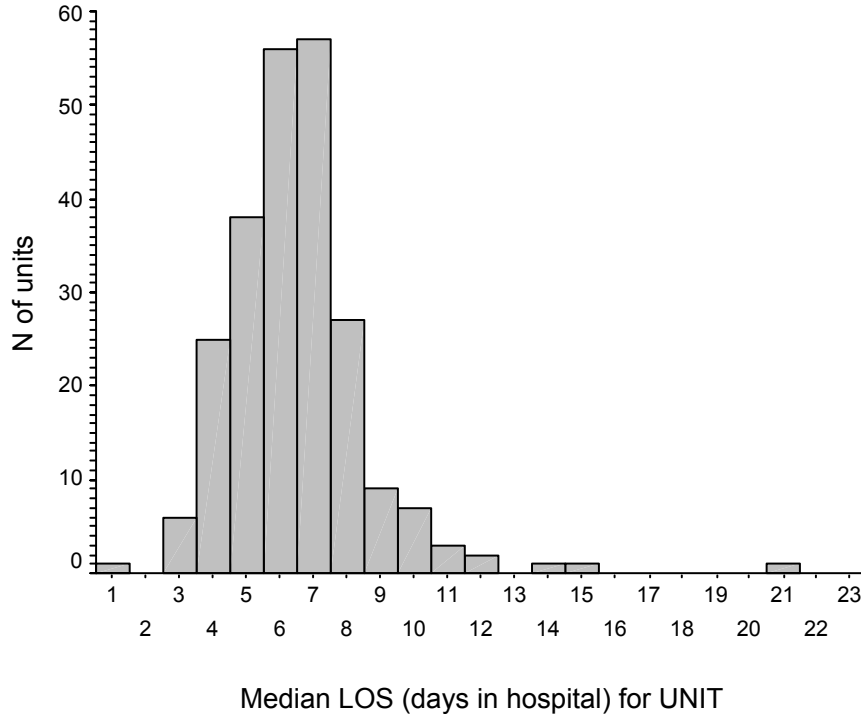
LOS in hospitals without access to an Early Discharge Scheme: % (n)

	National audit (4105/4246 episodes)		Your Unit (36)	
0-3 days	22	(885)	**25**	
4-7 days	34	(1408)	**28**	
8-14 days	27	(1105)	**25**	
15+ days	17	(707)	**22**	
Median (IQR) LOS	7 days	(4-11)	**Median:**	**7 days**

LOS in hospitals with access to an Early Discharge Scheme: % (n)

	National audit (3636/3767 episodes)		Your Unit (0)	
0-3 days	30	(1105)		
4-7 days	33	(1175)		
8-14 days	23	(820)		
15+ days	15	(536)		
Median (IQR) LOS	6 days	(3-10)	**Median:**	**days**

LOS in early discharge (or hospital at home) scheme: % (n)

Recorded for 61% (681) of 1125 in the scheme

	National audit (681 episodes)		Your Unit (0)	
0-3 days	20	(134)		
4-7 days	35	(240)		
8-14 days	30	(203)		
15+ days	15	(104)		
Median (IQR) LOS	7 days	(4-12)	**Median:**	**days**

DURING ADMISSION

Peripheral oedema present (noted at any time during admission): % (n)

	National audit (8013 episodes)		Your Unit (41)	
Yes	25	(1968)	**20**	**(8)**
No	52	(4141)	**34**	**(14)**
Don't know	24	(1904)	**46**	**(19)**

Serum albumin levels (g/l)

Missing for 33%

	National audit (5357 episodes)		Your Unit (32)	
Median (IQR)	38	34-41	**Median:**	**41**
% (n) < 34 g/l	20%	(1072)	**16%**	

Blood urea levels (mmol/litre)

Missing for 8%

	National audit (7341 episodes)		Your Unit (33)	
Median (IQR)	6.0	4.4-8.4	**Median:**	**6.3**
% (n) > 7.1 mmol/litre	36%	(2641)	**33%**	

Blood creatinine level (umol/litre)

Missing for 8%

	National audit (7381 episodes)		Your Unit (33)	
Median (IQR)	88	74-107	**Median:**	**84**

Arterial blood gases on admission: % (n)

	National audit (8013 episodes)		Your Unit (41)	
Yes	83	(6617)	**76**	**(31)**
No	14	(1161)	**7**	**(3)**
Don't know	3	(235)	**17**	**(7)**
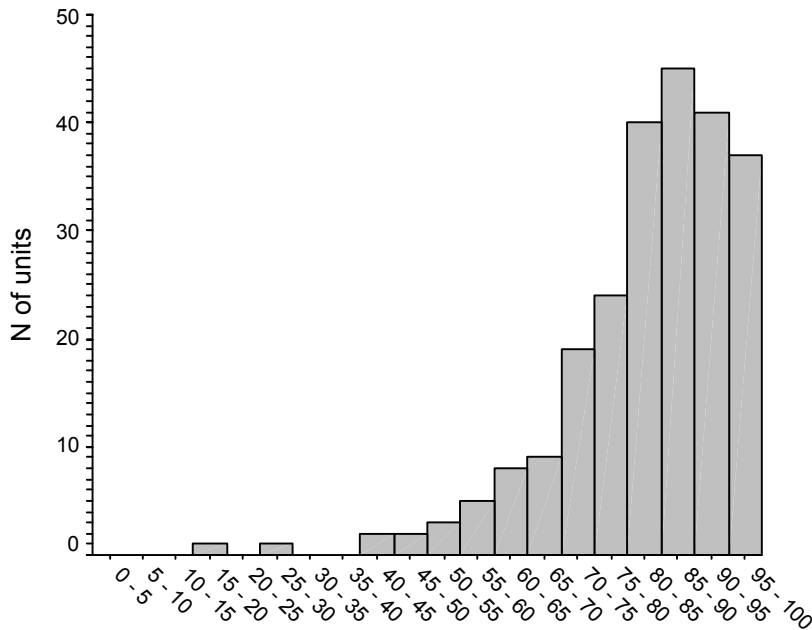
UNIT % of cases with arterial blood gases on admission

Did patient receive high flow oxygen (eg in ambulance) before arterial blood gases were taken: % (n)

	National audit (6617 episodes with blood gases)		Your Unit (31)	
Yes	25	(1629)	**16**	**(5)**
No	34	(2236)	**29**	**(29)**
Don't know	42	(2752)	**55**	**(17)**

Arterial blood gases results: % (n)

		National audit		Your Unit	
pH	6540 tests			**29 tests**	
	<7.26	7	(487)	**10**	
	7.26-7.34	15	(968)	**7**	
	7.35+	78	(5085)	**83**	
	Median (IQR)	7.40	7.36-7.44	**Median:**	**7.41**
Bic	5866 tests			**29 tests**	
	<23	12	(719)	**3**	
	23-30	65	(3826)	**52**	
	>30	23	(1321)	**45**	
	Median (IQR)	27	24-30	**Median:**	**30**
PCO2	6523 tests			**30 tests**	
	<= 6.0	54	(3506)	**43**	
	> 6.0	46	(3017)	**57**	
	Median (IQR)	5.9	5.0-7.3	**Median:**	**6.3**
PO2	6514 tests			**29 tests**	
	<7.3	19	(1259)	**34**	
	7.3-8.0	12	(758)	**14**	
	>8.0	69	(4497)	**52**	
	Median (IQR)	9.2	7.7-11.8	**Median:**	**8.2**

Patient on oxygen or air: % (n)

6617 with Blood gases taken

	National audit (6617 episodes)		Your Unit (31)	
Oxygen	56	(3732)	**35**	**(11)**
Air	32	(2141)	**52**	**(16)**
Don't know	11	(744)	**13**	**(4)**

Fraction of oxygen:

Fraction known for 93% (3463) of 3732 on oxygen

	National audit (3463 episodes)		Your Unit (10)	
Controlled*	76	(2619)	**90**	**(9)**
Uncontrolled	24	(844)	**10**	**(1)**

* <=28% or <= 4 litres

Chest x-ray appearance: % (n)

	National audit (8013 episodes)		Your Unit (41)	
CXR – no abnormality	14	(1148)	**10**	**(4)**
Changes consistent with COPD	38	(3045)	**37**	**(15)**
Changes consistent with pneumonia	14	(1117)	**17**	**(7)**
Suspected or definite cancer	2	(150)	**0**	**(0)**
Other abnormality	20	(1598)	**20**	**(8)**
X-ray poor quality or unhelpful	1	(80)	**0**	**(0)**
Not recorded	15	(1165)	**5**	**(2)**

Chest x-ray comments made by: % (n)

	National audit (8013 episodes)		Your Unit (41)	
Respiratory consultant	7	(545)	**0**	**(0)**
Non-respiratory consultant	9	(735)	**2**	**(1)**
Registrar	10	(809)	**20**	**(8)**
SHO	32	(2583)	**37**	**(15)**
PRHO	4	(299)	**0**	**(0)**
Radiologist	11	(857)	**5**	**(2)**
Don't know	27	(2185)	**37**	**(15)**

Respiratory rate (per minute): % (n)

Known for 81% (6463)

	National audit (6463 episodes)		Your Unit (33)
<20	16	(1041)	**6**
20-29	62	(4030)	**73**
30+	22	(1392)	**21**
Median (IQR)	24	20-28	**Median: 24**

Weight Kg

Known for 40% (1692 males, 1496 females)

	National audit (3188 episode)		Your Unit (22)	
Median (IQR): Males	70	(59-82)	**Median:**	**72**
Median (IQR): Females	58	(48-71)	**Median:**	**52**

BMI

Known for 28% (1185 males, 1020 females)

	National audit (2205 episodes)		Your Unit (14)	
Median (IQR): Males	24	(21-28)	**Median:**	**26**
Median (IQR): Females	24	(20-29)	**Median:**	**24**

Systemic corticosteroids for more than 24 hours as an inpatient: % (n)

	National audit (8013 episodes)		Your Unit (41)	
Yes	81	(6483)	**63**	**(26)**
No	16	(1266)	**20**	**(8)**
Don't know	3	(264)	**17**	**(7)**
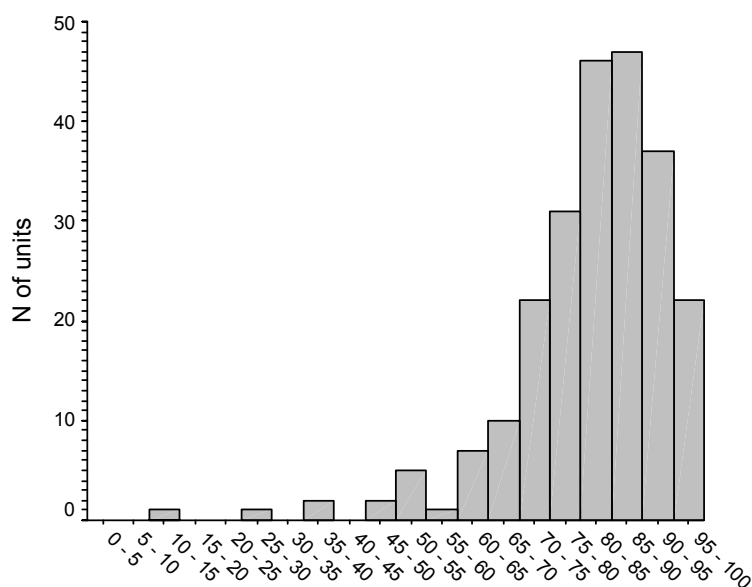
UNIT: % with systemic corticosteroids for >24 hrs as inpatient

Controlled oxygen as an inpatient: % (n)

	National audit (8013 episodes)		Your Unit (41)	
Yes	76	(6071)	**76**	**(31)**
No	16	(1294)	**7**	**(3)**
Don't know	8	(648)	**17**	**(7)**

Inspired oxygen fraction: % (n)

Fraction known for 95% (5761) of 6071 on oxygen

	National audit (5761 episodes)		Your Unit (29)	
Controlled*	90	(5178)	**100**	**(29)**
Uncontrolled	10	(583)	**0**	**(0)**

* <=28% or <= 4 litres

Oxygen saturation on the inspired fraction: % (n)

Saturation known for 90% (5192) of 5761 with inspired fraction

	National audit (5192 episodes)		Your Unit (29)
<86 percent	6	(326)	**3**
86-92 percent	23	(1212)	**21**
> 92 percent	70	(3654)	**76**
Median (IQR)	95	(92-97)	**Median:** 95

Most recent spirometry (in last 5 years):

FEV1 level

Known for 55% (2359 males, 2061 females). Your unit: **44**%

UNIT: % with FEV1 recorded
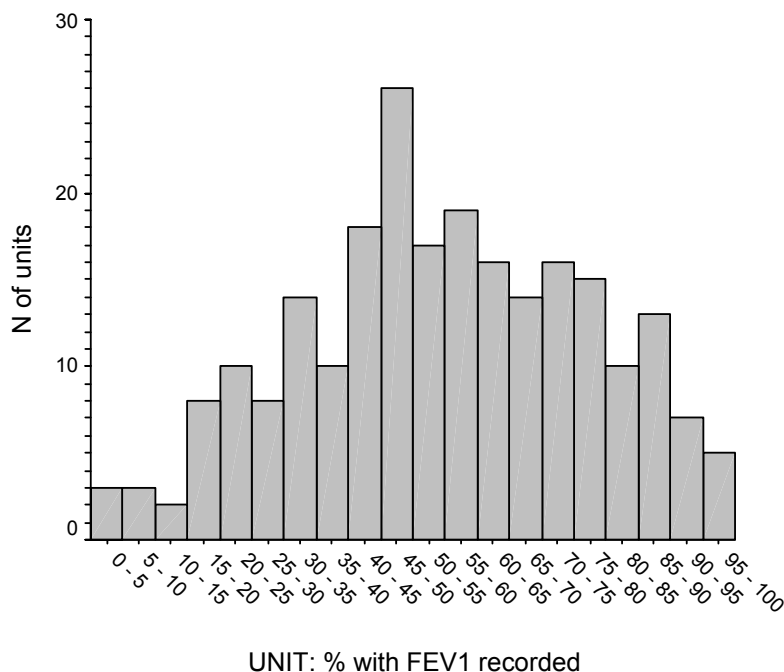
		National audit (4420 episodes)		**Your Unit (18)**	
Male	Median (IQR)	0.92	(0.69-1.30)	**Median:**	**1.16**
Female	Median (IQR)	0.74	(0.55-1.00)	**Median:**	**0.94**

FEV1 % of predicted

Known for 43% (3448)

	National audit (3448 episodes)		**Your Unit (16)**	
Median (IQR)	37	(28-50)	**Median:**	**44**

Was the pH < 7.35 at any time during the admission: % (n)

	National audit (8013 episodes)		**Your Unit (41)**	
Yes	23	(1805)	**15**	**(6)**
No	63	(5020)	**61**	**(25)**
Don't know	15	(1188)	**24**	**(10)**

(If <pH 7.35) What was the lowest pH:

Known for 91% (1642) of 1805 with pH <7.35

	National audit (1650 episodes)		**Your Unit (4)**	
Median (IQR)	7.27	7.20-7.31	**Median:**	**7.17**

Was there a second set of arterial blood gases (ABG's) taken: % (n)

	National audit (8013 episodes)		**Your Unit (41)**	
Yes	40	(3162)	**37**	**(15)**
No	54	(4367)	**46**	**(19)**
Don't know	6	(484)	**17**	**7)**

pH results (2nd set): % (n)

		National audit (3128 episodes)		**Your Unit (14)**	
pH	<7.26	10	(307)	**21**	
	7.26-7.34	20	(622)	**7**	
	7.35+	70	(2199)	**71**	
	Median (IQR)	7.39	7.33-7.43	**Median:**	**7.37**

Ventilatory support: % (n)

	National audit (8013 episodes)		Your Unit (41)	
Yes	10	(785)	7	(3)
No	86	(6909)	76	(31)
Don't know	4	(319)	17	(7)
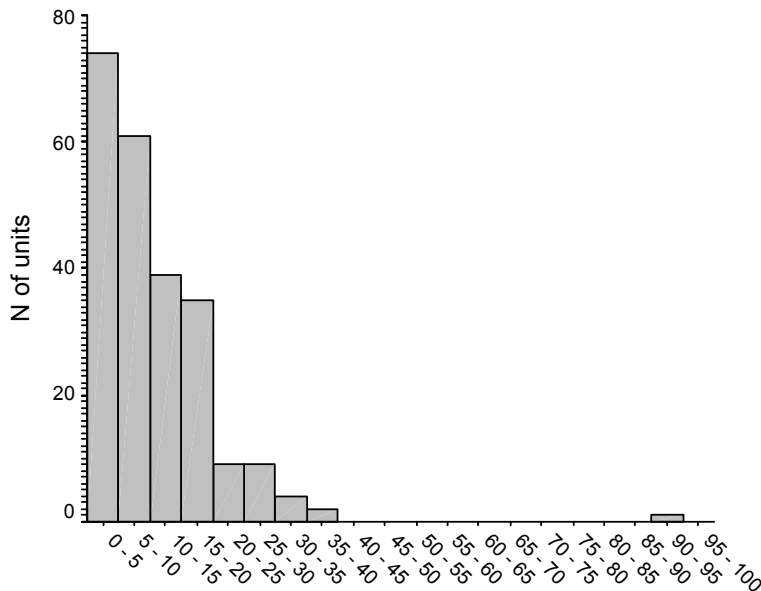
UNIT: % of cases with ventilatory support

If known, Type of ventilatory support: % (n)

	National audit (7694 episodes)		Your Unit (34)	
Invasive	1	(103)	3	(1)
Non-invasive	9	(657)	6	(2)
Doxapram	0.5	(39)	3	(1)

If patient had a pH of <7.35 and did not receive either invasive or non-invasive ventilation, then why not?

1805 had a pH < 7.35 at any time during the admission, and 62% (1113) did not receive ventilatory support (Table below): % (n)

	National audit (1805 episodes)		Your Unit (6)	
Yes	37	(671)	50	(3)
No	62	(1113)	50	(3)
Don't know	1	(21)	0	(0)
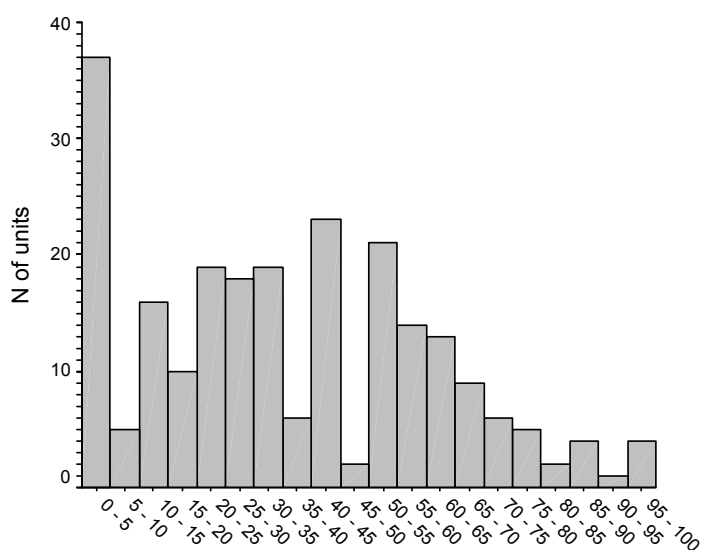
UNIT: % of cases with ventilatory support if pH<7.35

A reason for ventilatory support not being given was known for 36% (402/1113): – as medically inappropriate (n=340), no facilities (n=44), patient refused (n=15), failed (n=3). This low response (402/1113) may be partly due to technical difficulties in that some responses to this question may not have been saved by the software. Thus these results should be treated with caution.

Patient seen by a respiratory specialist (respiratory nurse or respiratory physician) during admission: % (n)

	National audit (8013 episodes)		Your Unit (41)	
Yes	70	(5595)	**56**	**(23)**
No	27	(2165)	**27**	**(11)**
Don't know	3	(253)	**17**	**(7)**

For inpatients which consultant's care was patient under at discharge: % (n)

	National audit (8013 episodes)		Your Unit (41)	
Respiratory physician	47	(3746)	**39**	**(16)**
General physician	33	(2642)	**29**	**(12)**
Care of elderly physician	15	(1203)	**15**	**(6)**
Other	2	(199)	**0**	**(0)**
Don't know	3	(223)	**17**	**(7)**

PATIENT DATA: 90 DAY OUTCOME

8013 episodes, 7556 patients. 407 patients (5%) were in the audit more than once, and for the outcomes analyses only the data relating to the first episode of care in the audit was considered.

Readmision

6781 patients were known to have been discharged.

Patient admitted to hospital, or accepted by an early discharge scheme, within 90 days of the audit index episode of care admission date: % (n)

	National audit (6781 discharged patients)		Your Unit (26)	
Yes	31	(2069)	**54**	**(14)**
No	67	(4527)	**46**	**(12)**
Don't know	3	(185)	**0**	**(0)**

*Variation between un*its: For those 230 units submitting 10 or more patients the median re-admission rate at 90 days was 32%, IQR 22-40%:-
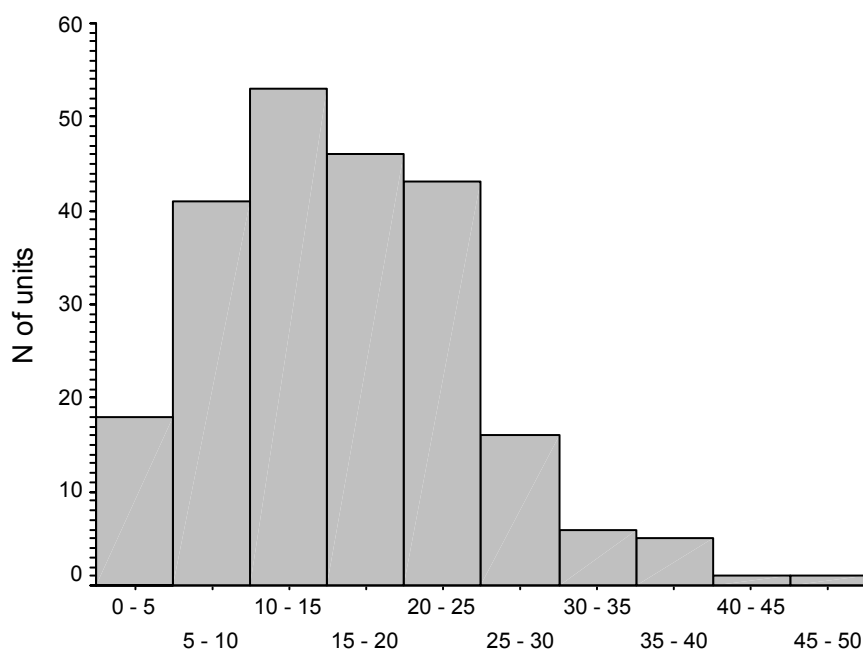

UNIT: % of patients re-admitted <90 days
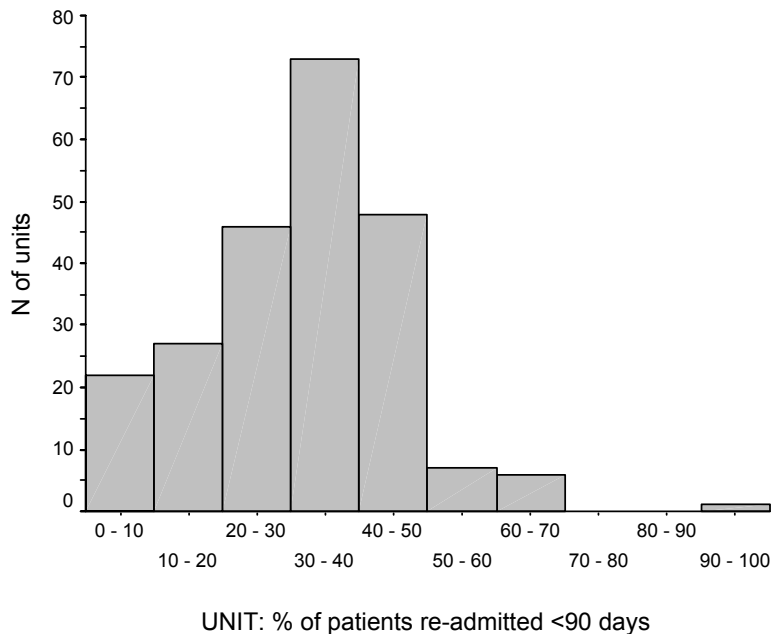
Survival

Patient still alive at 90 days after admission: % (n)

Status (Yes/No) known for 96% (7289)

	National audit (7289 patients)		Your Unit (25)	
Yes, Alive	84.7	(6172)	**60**	**(15)**
No, Died	15.3	(1117)	**40**	**(10)**

*Variation between un*its: For those 229 units with status known for 10 or more patients the median death rate at 90 days was 15%, IQR 9-21%:-

UNIT: mortality rate (%) within 90 days of admission

If we don't know (n=267), why was this?: % (n)

	National audit (267 patients)		Your Unit (13)	
Notes not available	7	(19)	**0**	**(0)**
No information from GP	36	(96)	**0**	**(0)**
Other	13	(35)	**8**	**(1)**
Don't know	44	(117)	**92**	**(12)**

What patient died from: % (n)

|	National audit (1117 deaths < 90 days)		Your Unit (10)	
COPD or complication from COPD	71	(789)	**40**	**(4)**
Other causes	17	(191)	**10**	**(1)**
Don't know	12	(137)	**50**	**(5)**

Inpatient mortality

Patient died in hospital during initial admission in audit (i.e. excludes deaths during subsequent readmission): % (n)

Known for 97% (7328)

	National audit (7328 patients)		Your Unit (29)	
YES (died in hospital)	7.5	(547)	**10**	**(3)**
NO	92.5	(6781)	**90**	**(26)**

*Variation between un*its: For those 230 units with status known for 10 or more patients the median inpatient death rate was 7%, IQR 3-11%:-

UNIT: inpatient mortlaity (%)
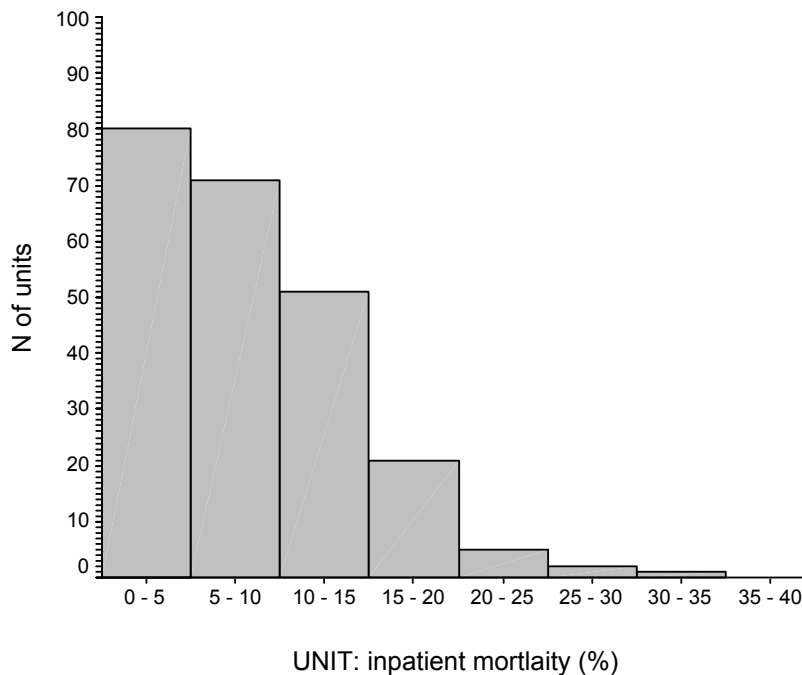
CONCLUSIONS

The first UK national audit of acute COPD care has been very successful, with a very high participation rate and reliable data quality. As in previous, smaller audits, large differences in resources and process of care between participating sites have been highlighted.

Patients admitted with an acute exacerbation of COPD have a high mortality, with 15% dying within 90 days of admission. This audit has shown that some sites do not have the resources to provide adequate care for these high risk patients.

Process of care between units varies widely, and might explain some of the large variations in mortality between units. Readmission rates and 90 day mortality from acute COPD remain high, and are similar to previous audits. It is hoped that the detailed information from this national audit can shed light on the causes of this, and explain some of the differences between units.

This national audit should lead to recommendations on the level of resources needed and standards of care required for the management of patients admitted with acute COPD. It is hoped that improvements in process of care will reduce the mortality, readmission rate and length of stay for this common and serious condition.

Further reports will examine these areas in more detail.

REFERENCES

[1] Pearson MG, Littler J, Davies PDO. An analysis of medical workload by speciality and diagnosis in Mersey - evidence of patient to specialist mismatch. J. Roy. Coll. Phys. 1994; 28: 230-234

[2] Office of National Statistics Mortality Statistics: Cause 1999, England and Wales London The Stationery Office

[3] BTS Guidelines for the Management of Chronic Obstructive Pulmonary Disease. Thorax 1997; 52(supp 5) :S1-28

[4] Roberts CM, Ryland I, Lowe D, Kelly Y, Bucknall CE, Pearson MG. Audit of acute admissions of COPD: standards of care and management in the hospital setting. Eur Respir J 2001; 17:343-9

[5] Roberts CM, Ryland I, Lowe D, Kelly Y, Bucknall CE, Pearson MG. Clinical audit indicators of outcome following admission to hospital with acute exacerbation of chronic obstructive pulmonary disease. Thorax 2002;57:137-141.

[6] Roberts CM, Barnes S, Lowe D, Pearson MG; Clinical Effectiveness Evaluation Unit, Royal College of Physicians; Audit Subcommittee of the British Thoracic Society. Evidence for a link between mortality in acute COPD and hospital type and resources. Thorax. 2003 Nov;58(11):947-9.