# In-Hospital Prevalence of Respiratory Compromise in England

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1. Medtronic

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1.Respiratory Compromise Institute. http://www.respiratorycompromise.org/. 2017.

\*...where patients may or may not had death at the end of the episode. \*\*Death may or may not be attributable to RC.

## ABSTRACT

### Objective

Respiratory compromise (RC) is a state in which there is a high likelihood of decompensation into respiratory insufficiency, respiratory failure, respiratory arrest or death, but in which specific interventions (continuous monitoring and therapies) might prevent or mitigate decompensation.<sup>1</sup> The objective of this retrospective analysis is to estimate in-hospital prevalence of RC for elective patients in NHS England and determine risk-factors associated with RC events.

### Methods

 A retrospective analysis was completed from 1,851,347 elective episodes for NHS fiscal year 2015-16 using the Hospital Episode Statistics (HES) dataset. An RC event was defined as an elective episode which lasted at least 1 day and incurred by patients of at least 1 year of age who had an RC-related diagnosis or intervention.

### Results

From the initial criteria, there were 1,851,347 total elective episodes out of 1,662,469 patients. Of these, 31,613 (1.9%) were RC events\*, of which 2,665 (0.16%) resulted in death. Risk of RC appears to be age-, but not gender-related, and more frequently incurred in the medical consultant specialty rather than in the surgical consultant specialty. Top diagnoses for patients who had an RC event were hypertension, respiratory failure, and chronic ischemic heart disease, and top procedures were ventilation support, implantation of cardiac pacemaker, and other vein related procedures.

### Conclusions

• In-hospital RC event rate in England is relatively common. Multiple factors are associated with in-hospital RC events and may suggest a need for better patient monitoring and risk-stratification for better patient outcomes.

# **METHODS**

- A retrospective analysis was completed using the Hospital Episode Statistics (HES) dataset extracted for the NHS fiscal year 2015-16.
- Initial criteria for episode inclusion were:
  - Elective admissions
  - Length of episode > 0 days
  - OPCS (Procedure) must be in episode
  - Age must be  $\geq 1$
  - Having at least 1 RC-related code
- For the statistical analysis, episodes were further required to include information on:
  - Age
  - Gender
  - Consultant specialty

 RC was defined as having at least one of the following diagnoses or procedures:

#### Definition of RC (OPCS and ICD codes)

Advanced cardiac pulmonary resuscitation (OPCS: X503)

Cardiac arrest with successful resuscitation (ICD10: I460)

Respiratory arrest (ICD10: R092)

Opioids and related analgesics causing adverse effects in therapeutic use (ICD10: Y450)

Acute respiratory failure (ICD10: J960)

Respiratory failure unspecified (ICD10: J969)

Other and unspecified abnormalities of breathing (ICD10: R068)

Other specified respiratory disorders (ICD10: J989)

Invasive ventilation (OPCS: E851)

Non-invasive ventilation NEC (OPCS: E852)

Death on general ward (excluding still born) <u>Note</u>: Episodes where there was death but no RC code were excluded from the analysis.

# RESULTS (1/3)

- From the initial criteria, there were 1,851,347 total episodes had by 1,662,469 patients.
- Of these, 31,613 (1.9%) were RC events\*, of which 2,665 (0.16%) resulted in death\*\*:
  - RC events were more frequently incurred in medical consultant specialty area than in surgical area (Figure 1)
  - Respiratory/thoracic medicine, cardiac surgery, and critical care medicine were top 3 consultant specialties for the patients who had an RC event (Figure 2)
  - The risk of RC appears to be age related, with highest frequency in the 50-80 year age group (Figure 3), but does not differ significantly between males and females

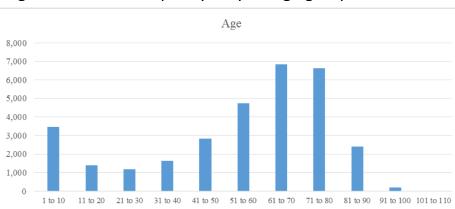


Figure 3: RC events split by 10-year age groups.

Figure 1: RC events split by consultant specialty area

Consultant Specialty Area	RC events
Medical	17,624
Surgical	13,880

Figure 2: Top 20 consultant specialties for RC events

Top 20 Consultant Specialties	RC events
Respiratory/thoracic medicine	4,765
Cardiac surgery	4,438
Critical care medicine	1,971
Respiratory Physiology	1,937
Cardiology	1,497
General surgery	1,489
Trauma & orthopaedics	1,457
Paediatric Respiratory Medicine	1,376
Paediatric Intensive Care	1,180
Thoracic surgery	753
Cardiothoracic surgery	705
General medicine	688
Urology	585
Neurosurgery	578
Colorectal surgery	539
ENT	513
Obstetrics	483
Paediatrics	465
Vascular surgery	461
Paediatric Ear Nose and Throat	406

\*...where patients may or may not had death at the end of the episode. \*\*Death may or may not be attributable to RC.

# **RESULTS (2/3)**

- Top 10 (most common) diagnoses in patients who had an RC event:
  - 1. Essential (primary) hypertension
  - **Respiratory failure** 2.
  - Chronic **ischemic heart** disease 3.
  - Abnormalities of breathing 4.
  - Atrial fibrillation and flutter 5.
  - Other disorders of fluid, electrolyte and acid-6. base balance
  - 7. Non-insulin-dependent diabetes mellitus
  - 8. Pneumonia
  - **9.** Sleep disorders
  - **10. Surgical operation** and other surgical procedures as the cause of abnormal reaction of the patient, or of later complication

Notable mentions: **Obesity** is #11, Acute Renal Failure #13.

#### Figure 4: Top comorbidities (diagnoses) in RC population

I10: Essential (primary) hypertension	11,174
J96: Respiratory failure, not elsewhere classified	9,668
I25: Chronic ischaemic heart disease	9,317
R06: Abnormalities of breathing	6,944
I48: Atrial fibrillation and flutter	5,661
E87: Other disorders of fluid, electrolyte and acid-base balance	5,146
E11: Non-insulin-dependent diabetes mellitus	4,995
J18: Pneumonia, organism unspecified	4,916
G47: Sleep disorders	4,878
Y83: Surgical operation and other surgical procedures as the.	4,569
E66: Obesity	4,124
E78: Disorders of lipoprotein metabolism and other lipidaemias	4,116
N17: Acute renal failure	4,055
J98: Other respiratory disorders	3,943
J90: Pleural effusion, not elsewhere classified	3,895
J44: Other chronic obstructive pulmonary disease	3,772
T81: Complications of procedures, not els ewhere classified	3,744
I50: Heart failure	3,664
F17: Mental and behavioural disorders due to use of tobacco	2,886
I46: Cardiac arrest	2,860
J45: Asthma	2,579
Y95: Nosocomial condition	2,551
N18: Chronic kidney disease	2,521
I20: Angina pectoris	2,488
151: Complications and ill-defined descriptions of heart disease	2,479
B96: Other specified bacterial agents as the cause of diseases	2,428
I95: Hypotension	2,131
I35: Nonrheumatic aortic valve disorders	1,958
IOS: Multiple valve diseases	1,844
K21: Gastro-oesophageal reflux disease	1,688
F32: Depressive episode	1,613
R00: Abnormalities of heart beat	1,604
A41: Other sepsis	1,602
E03: Other hypothyroidism	1,580
Y45: Analgesics, antipyretics and anti-inflammatory drugs	1,428
J22: Unspecified acute lower respiratory infection	1,388
D64: Other anaemias	1,383
I21: Acute myocardial infarction	1,229
I44: Atrioventricular and left bundle-branch block	1,194
N39: Other disorders of uninary system	1,181
I27: Other pulmonary heart diseases	1,170
171: Aortic aneurysm and dissection	1,148
K.59: Other functional intestinal disorders	1,121
R11: Nausea and vomiting	1,094
B95: Streptococcus and staphylococcus as the cause of diseases.	1,071
F05: Delirium, not induced by alcohol and other psychoactive	1,014
I31: Other diseases of pericardium	992
F41: Other anxiety disorders	991
G40: Epilepsy	972
I49: Other cardiac arrhythmias	958

# RESULTS (3/3)

- Top 10 (most common) procedures\* in patients who had an RC event:
  - 1. Ventilation support
  - 2. Other cardiac **pacemaker** system (i.e., epicardial implantation of cardiac pacemaker)
  - 3. Other vein related operations
  - 4. Compensation of renal failure
  - 5. Connection of thoracic artery to coronary artery
  - 6. Saphenous vein graft replacement
  - 7. Exteriorization of trachea
  - 8. Plastic repair of aortic valve
  - 9. External resuscitation
  - **10.** Puncture of pleura

\*Selected (but not all) body approach and diagnostic procedures have been removed in the graph, hence when presenting top 10, the remaining approach and diagnostic procedures (e.g., radiology) were excluded from being mentioned in the top 10. Additionally, mention of

#### Figure 5: Top procedures in RC population\*

E85: Ventilation support	21,532
Y98: Radiology procedures	7,972
K61: Other cardiac pacemaker system	4,797
Y70: Early operations NOC	4,624
L91: Other vein related operations	4,051
Y97: Radiology with contrast	3,746
X40: Compensation for renal failure	3,167
K45: Connection of thoracic artery to coronary artery	
K40: Saphenous vein graft replacement of coronary artery	2,554
E42: Exteriorisation of trachea	2,324
K26: Plastic repair of aortic valve	1,936
X50: External resuscitation	1,821
T12: Puncture of pleura	1,419
Y75: Minimal access to abdominal cavity	1,381
M47: Urethral catheterisation of bladder	1,298
A84: Neurophysiological operations	<b>—</b> 1,016
X33: Other blood transfusion	802
L71: Therapeutic transluminal operations on other artery	<b>7</b> 41
L99: Other therapeutic transluminal operations on vein	<b>7</b> 17
X36: Blood withdrawa1	<b>7</b> 11
K25: Plastic repair of mitral valve	<b>6</b> 90
Y03: Attention to prosthesis in organ NOC	<b>=</b> 606
Y74: Minimal access to thoracic cavity	581
K34: Other open operations on valve of heart	<b>5</b> 77
E91: Oximetry testing	526
V 55: Levels of spine	525
W40: Total prosthetic replacement of knee joint using cement	<b>5</b> 01
K60: Cardiac pacemaker system introduced through vein	498
T46: Other drainage of peritoneal cavity	477
K63: Contrast radiology of heart	<b>466</b>
E54: Excision of lung	<b>466</b>
K56: Transluminal heart assist operations	438
T03: Opening of chest	433
U54: Rehabilitation for other disorders	424
L19: Other replacement of aneurysmal segment of aorta	423
X90: High cost haematology and nutrition drugs	415
T41: Other open operations on peritoneum	<b>4</b> 04
T85: Block dissection of lymph nodes	<b>4</b> 00
Y22: Drainage of organ NOC	390
T87: Excision or biopsy of lymph node	383
X86: High cost anti-infective drugs	378

# CONCLUSIONS

- In-hospital RC in England is relatively common and the incidence is similar to that reported for US retrospective database analyses<sup>1</sup>.
- Multiple factors are associated with in-hospital RC events and may suggest a need for better patient monitoring and patient stratification to improve patient outcomes.

 Development Of Postoperative Pulmonary Complications After Admission To General Care Floor In Elective Surgery Cases- Kelley, Scott; Agarwal, Santosh; Parikh, Niraj Erslon, Mary; Morris, Peter /Critical Care Medicine Volume 40(12) Supplement 1, December 2012DOI: 10.1097/01.ccm.0000424958.25075.6c