Tracheostomy in Covid-19 – what can we expect?

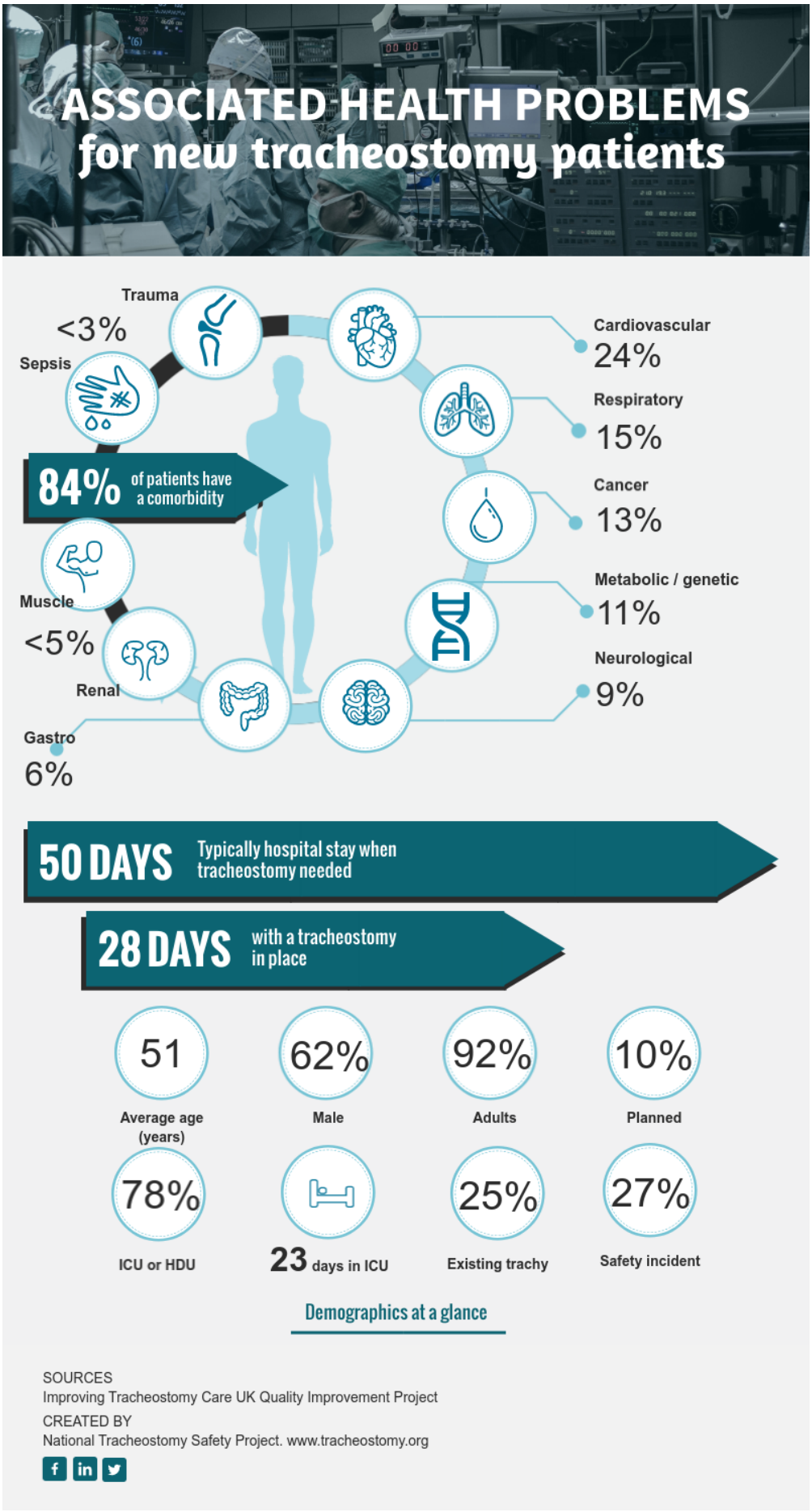
Tracheostomies in context

In Tracheostomies are small tubes inserted into the neck acting as artificial airways for around 15,000 patients in England and Wales annually.[1-4] Patients are often complex, cross traditional speciality working boundaries and locations, and are dependent on competent, knowledgeable care to keep them safe. Around 2/3 of all new tracheostomies are performed in the critically ill, usually to facilitate prolonged ventilation (>2 weeks) or to allow patients to gradually 'wean' from invasive ventilation. The remaining 1/3 are undertaken by head and neck surgeons, predominantly for airway obstruction and cancer surgery. Around 5,000 patients with existing tracheostomies are admitted from the community back into hospitals each year.

Landmark studies consistently highlight failings in care provision, with themes relating to inadequate staff training, equipment provision and infrastructure leading to avoidable patient harm, morbidity and mortality.[2, 5-7] Simply requiring a tracheostomy is associated with in-hospital mortality reported from 20-60%, usually due to underlying illness.[8,9] However, institutional harm also occurs, with up to 30% of tracheostomy patients experiencing an untoward incident. Measurable harm occurs in 60-70% of such incidents, ranging from hospital or Intensive Care Unit (ICU) (re)admission, prolonged in-patient stays, hypoxic brain injury and death.[6-7] Delays in care are common due to the complexities and variety of services accessed by tracheostomised patients.[10]

Many of these problems are amenable to prospective quality improvement (QI) strategies, leading to the development of groups such as the UK National Tracheostomy Safety Project (NTSP, www.tracheostomy.org.uk) and the Global Tracheostomy Collaborative (GTC, www.globaltrach.org) providing resources and strategies to improve care. The GTC brings together institutions, teams and individuals who have demonstrated approaches or interventions that can improve quality and/or safety.[11] Importantly, teams comprising of multidisciplinary members from diverse specialities are involved in tracheostomy care, including prominent and central roles for patients, families and/or carers.[12]

Patients managed in our hospitals with temporary or permanent tracheostomies on wards or in critical care units are exposed to a wide range of healthcare professionals and specialities, with the anaesthetist and critical care specialists often pivotal in their inpatient journey. Despite this, it is surprisingly difficult to find national data on the number of patients managed with tracheostomy. What detailed data there are suggests that 7-19% of all patients admitted to an Intensive Care Unit (ICU) will be managed with a tracheostomy, and that up to 90% of these ICU tracheostomies are currently performed by percutaneous routes.[15,16] This figure varies with the admission diagnosis, individual units, and to some extent, the country.[13,17-21]. Most non-neuro ICU's have a trachy rate around 10-13% in the UK. Neurosurgical centres typically have slightly higher rates, between 15-20%. The data from a recent UK study looking at the profile of 2,405 tracheostomy admissions is detailed overleaf. Considering all tracheostomy patients (new insertions and existing tracheostomies), patients typically spend 50 days in hospital, 28 days with a tracheostomy in situ and 23 days in an ICU. For new insertions, some of this ICU/hospital stay is before/after the tracheostomy is inserted.


ASSOCIATED HEALTH PROBLEMS
for new tracheostomy patients
Trauma
<3%
Sepsis
84% of patients have a comorbidity
Muscle
<5%
Renal
Gastro
6%
Cardiovascular
24%
Respiratory
15%
Cancer
13%
Metabolic / genetic
11%
Neurological
9%
50 DAYS Typically hospital stay when tracheostomy needed
28 DAYS with a tracheostomy in place
51
Average age (years)
62%
Male
92%
Adults
10%
Planned
78%
ICU or HDU
23 days in ICU
25%
Existing trachy
27%
Safety incident
Demographics at a glance
SOURCES
Improving Tracheostomy Care UK Quality Improvement Project
CREATED BY
National Tracheostomy Safety Project. www.tracheostomy.org

Summary of reports of Covid-19 cases requiring prolonged invasive ventilation in ICU: Evidence scan as of 20/3/20.

Detailed reports and case series are emerging from China and Europe which allow some cautious predictions of the potential tracheostomy burden for critical care services (and elsewhere). The prevalence of hypoxic respiratory failure in a cohort of 44,415 Chinese patients with confirmed COVID-19 was 19%, with 14% described as 'severe' (dyspnea, respiratory frequency ≥30/min, blood oxygen saturation ≤93%, partial pressure of arterial oxygen to fraction of inspired oxygen ratio <300, and/or lung infiltrates >50% within 24 to 48 hours) [22]. Some 5% of this cohort developed critical organ failure. Recent reports from China showed that 4% to 13% of COVID-19 patients in these studies received non-invasive positive pressure ventilation (NIPPV), and that 2.3% to 12% required invasive mechanical ventilation [22-27].

In critically ill patients, the case fatality rate is consistently reported around 50%; higher in those who received invasive mechanical ventilation. The presence of pre-existing comorbid conditions such as cardiovascular disease, diabetes, chronic respiratory disease, hypertension, and cancer were associated with higher risk of death [22].

Detailed data has emerged from Italy, describing 1,569 patients (from 1 to 17/3/20) admitted to critical care units in the North of the county, 94% of whom were intubated and ventilated. At the time of the report, 227 (≈14%), patients had survived and been discharged from ICU 256 (≈16%) had died, leaving 1,037 (≈66%) still receiving support. Median age of the current patients was 62 years, with 82% males. These patients all had significant hypoxia and high ventilatory requirements: median PEEP 14 (12-15), Fi O_2 0.55 (0.45-0.70) [29]

Limited data from both China and Italy describe the prolonged intubation and ventilatory support that many of these patients require as they recover from pneumonia; often 15 to 20 days of mechanical ventilation, with several hours spent in the prone position and then, typically, a very slow weaning.[29] One Chinese study reported 42.5% mortality at 14 days post ICU admission, with the vast majority of survivors beyond 14 days still being ventilated.

The expected surge in intubated and ventilated patients as a result of Covid-19 will result in a significant increase in patients who require prolonged mechanical ventilation (>14 days), even allowing for the higher mortality rates than normal in this group. Patients requiring prolonged ventilation would ordinarily be candidates for a tracheostomy to facilitate weaning. However, a tracheostomy may not be in a patients' best interests if the prospects of long-term independent survival are limited. These decisions may become more focused in a resource-limited, overwhelmed system.

Tracheostomy may have some positive benefits in the Covid-19 pandemic, which may lead to earlier consideration than in normal practice:

- Tracheostomy offers a 'sealed' system for ongoing respiratory support which may be preferable to a primary extubation with a high chance of failure and/or the requirement for NIV/High Flow Oxygen therapy.

- Patients with tracheostomy are typically managed with reduced or no sedation. This may allow for:
    - Less intensive nursing care (the patient may be able to assist in moving, rolling).
    - Fewer pumps (advantageous if there is a shortage of drugs or devices).
    - Care may be overseen by non-ICU staff (who aren't as experienced in managing sedation perhaps).
    - However, a more awake patient can be more difficult to manage, and staff must be able to safely care for tracheostomised patients. (There may be a role for ORL/ENT/MaxFax staff here).

What do hospitals need to do now?

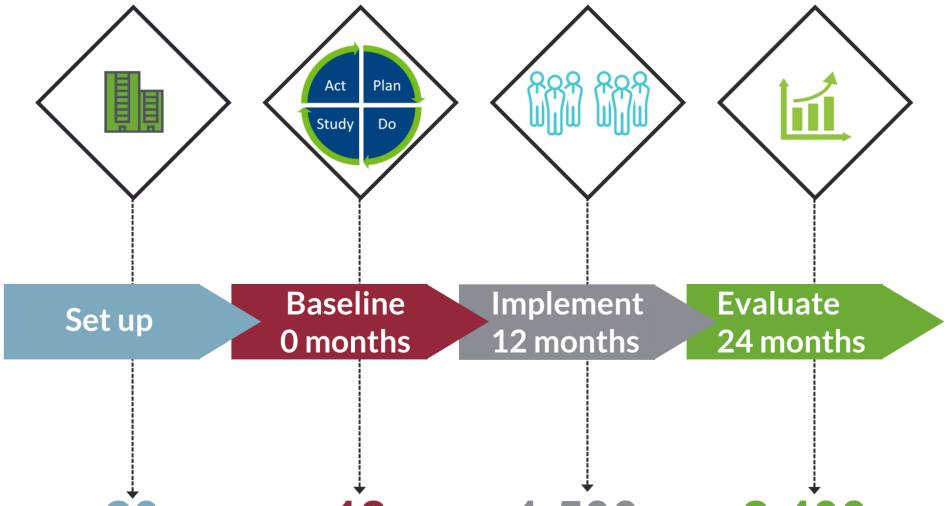
Indications from European ICUs suggest that decision making around access to critical care and organ support is based largely on current practice; the expectation is that this stands for decisions to undertake tracheostomy. The major indication will remain to wean from ventilation when a primary extubation is not possible, has failed, or if primary extubation is considered high risk (for the patient and/or for staff). Tracheostomy insertion itself is associated with known risks to the patient and less well understood risks to staff.

Hospitals need to prepare for a surge in the number of critically ill patients with tracheostomy, including patients who are recovering from critical illness who may still have a tracheostomy in situ. ICU beds are likely to be at a premium which may mean that tracheostomy patients are 'stepped down' into non-ICU locations. Similarly, 'critical care' locations may not be universally staffed by trained/regular ICU staff. Keeping patients safe requires that all locations in which patients with tracheostomies are cared for are appropriately staffed, equipped and supported.

The Tracheostomy National Patient Safety Improvement Program (NatPatSIP) builds on the successful implementation of a 20-site Quality Improvement (QI) program in the UK. Participating sites implemented 18 interventions designed to improve the quality, safety and organisational efficiency of tracheostomy care. The interventions came from established best practices from the exemplar hospitals comprising the Global Tracheostomy Collaborative (GTC). Patient level data was tracked using the GTC database with additional research exploring barriers and enablers to change and the perception of patents and their families around the care they received. The headline results are detailed overleaf.

Whilst the implementation and widespread adoption of quality improvement initiatives drove improvements in safety, during the Covid-19 crisis, this NatPAtSIP will initially focus on key interventions to improve tracheostomy safety.

Improving Tracheostomy Care



Assess readiness:	Patient-focussed:	Qualitative research:	Independent evaluations:
Leaders & teams	Effectiveness	Learning	Quality of care
Profile hospital	Quality	Enablers	Safety of care
Plan to change	Safety	Barriers	Economic impact

£275.04 million

per year saved by the NHS

if the results of this project were extrapolated to all NHS sites

£33,251

per patient saving

47% ↓

Reduction in patient reported anxiety and depression

20% ↓

Reduction in hospital stay
(Length of stay in hospital/ICU/with trachy)

170 lives saved

per year, if this project was extended nationally (compared with 2014 NCEPOD data)

55% ↓ Reduction in incident severity

Significant reduction in the frequency, nature and severity of patient safety incidents

58

Hospitals around the world collaborating to improve care:
New knowledge and resources
Strategies around *how* to improve care

See www.globaltrach.org & www.tracheostomy.org.uk

The Health Foundation · The Global Tracheostomy Collaborative · NTSP www.tracheostomy.org.uk National Tracheostomy Safety Project · RCoA Royal College of Anaesthetists

The detailed results of the *Improving Tracheostomy Care* program are currently *in press* with the *British Journal of Anaesthesia* and will be available shortly. Hospitals participating in the NatPatSIP should consider the following key interventions that improved care:

Organisational interventions included:

- Hospital-wide steering group
- Hospital-wide tracheostomy policy
- Designated cohort wards for tracheostomy patients
- Mandatory tracheostomy training for staff who will care for tracheostomy patients

Safety interventions included:

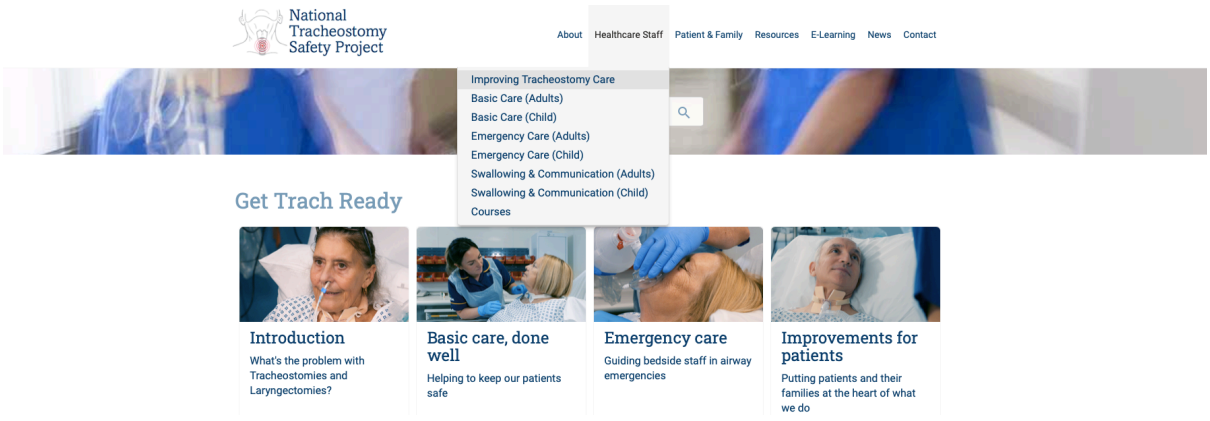
- Bedhead signs for patients (key details of the tracheostomy with emergency algorithm on the back)
- Standardised 'bedside' tracheostomy equipment
- Standardised tracheostomy care bundle

It is important to note that there are other elements to this program that complement the safety initiatives. Patients *expect* safe care but *want* high quality care. For patients with tracheostomies this means a focus on eating, drinking, talking and targeted efforts to promote less time on a ventilator, in ICU and in hospital.

Resources will be developed, supplied and signposted to that can help sites rapidly adopt these principles of safe practice. Access to the wider program will be supported and encouraged when operational pressures allow.

Hospitals are encouraged to join the Global Tracheostomy Collaborative (www.globaltrach.org). Membership provides access to a wide range of resources and peer support from international exemplar hospitals. The GTC also provides a patient-level database to track progress and to benchmark over time, and against other sites. Some data will be collected independently of the GTC as part of the NatPatSIP, and some data from existing ICU data collection systems can help to identify progress with tracheostomy care.

Much of the data to support this program are available from the Improving Tracheostomy Care section of the NTSP website (www.tracheostomy.org.uk).



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