

Changing an ingrained culture: Improving the safety of oxygen therapy at University Hospitals Bristol NHS Foundation Trust

Michelle Gatter, Giles Dixon, Josh Wall, Ed Mew
UH Bristol

Abstract

Oxygen is one of the most commonly administered drugs in UK hospitals. Our quality improvement project aimed to increase the safety of oxygen therapy at University Hospitals Bristol NHS Foundation Trust. We aimed to increase the rate of oxygen prescribing and increase the percentage of nurses signing appropriately for oxygen titration and administration. We hypothesised this would result in a higher percentage of patients achieving their appropriate oxygen saturations.

Our project ran on several acute medical and surgical wards. We tested several interventions with a plan, do, study, act method of continuous data collection. We firstly focussed on the education of junior doctors and then the wider multi-disciplinary team with a trust-wide "safety focus". We utilised patient safety systems already in place in the hospital, such as the clinical risk register and incident reporting system. We also trialled an intervention that was successfully implemented by another group in a different trust in the UK.

Oxygen prescription increased from 44.4% to 76.9% over the duration of the project. Appropriate nursing signatures increased from 26.6% to 60%. The number of patients achieving appropriate target saturations rose from 61.8% to 76.7%. The most successful interventions were the trust safety briefing and oxygen safety hangers.

Our project has showed the importance of integrating new projects within safety schemes already available. Persistence and careful intervention are key to changing strongly engrained cultures in large organisations. Interventions that have proved to be successful in other trusts can be implemented to enact change.

Problem

Our project focussed on the safe prescription, administration, and monitoring of oxygen at the Bristol Royal Infirmary (BRI). The Bristol Royal Infirmary is a university teaching hospital in South-West England.

The problems which we identified were: oxygen was not prescribed by medical staff, target oxygen saturations were not indicated by medical staff, target oxygen saturations were not effectively communicated to nursing staff, and oxygen was not always signed for appropriately by the nursing staff. These issues meant that target oxygen saturations were not always achieved by patients requiring supplementary oxygen. Failure to achieve target saturations is potentially dangerous and harmful for patients.

Background

Supplementary oxygen is widely administered to patients in hospital.[1] Current national UK audit data shows that 13.8% of 45,032 patients were receiving oxygen at the point of audit in August to November 2013. Oxygen is a drug which means it should be prescribed in all but emergency situations. Failure to administer oxygen appropriately can result in serious harm to the patient. Failure to act upon low oxygen saturations was designated as a National Health Service "never event" in 2013 following several

National Patient Safety Agency (NPSA) safety incidents reported in 2009.[2,3]

The British Thoracic Society implemented a Guideline for Emergency Use of Oxygen in adult patients in 2008.[4] These guidelines should form the backbone of oxygen prescription policy throughout the UK.

Oxygen can be delivered via a variety of devices and at varying flow rates. Oxygen should be titrated to achieve optimum saturations. These optimal saturations, known as "target sats", provide a guideline for titrating the dose of oxygen. The target saturations for an individual largely depend on whether they are at risk of type 2 respiratory failure. Conditions which can place patients at risk of type 2 respiratory failure include: moderate/severe chronic obstructive pulmonary disease, some patients with severe cystic fibrosis, bronchiectasis, chronic neuromuscular disorders, chest wall disorders, and morbid obesity. For these patients the appropriate target saturations would be 88-92%. All other patients should receive 94 to 98%.

Once target saturations have been decided, oxygen should then be prescribed on the drug chart, indicating the target saturations required. The prescription should include details about humidification and duration of therapy.

There is an important exemption to this rule, in an emergency

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situation a prescription for oxygen is not required. In certain emergency situation for example stroke and chest pain oxygen therapy is only indicated if saturations fall below 94%. In most other emergency situations high-flow oxygen should be administered via a non-re breathe mask.

Once oxygen has been prescribed by the medical staff it must be administered by nursing staff. This includes a number of steps; selection of delivery device, selection of flow rate, monitoring of saturations, appropriate adjusting to achieve target saturations, and documentation (signature) that oxygen is being administered. If oxygen delivery is adjusted the saturations should be closely monitored to ensure that target saturations are met.

Oxygen safety quality improvement projects have been previously reported. One previously reported project identified several difficulties in undertaking long-term projects such as the difficulty in engaging nursing staff in actively documenting oxygen delivery.[5] Other projects have looked at the short term effects of interventions such as oxygen safety hangers.[6] Our project aimed to tackle oxygen therapy across the trust, over a prolonged period of time targeting every aspect of oxygen delivery. Most importantly we wanted to ensure our interventions had a real effect on patient safety.

Baseline measurement

Oxygen prescriptions are routinely audited across the UK by the BTS emergency oxygen prescription audit. We selected a number of different parameters from the BTS audit to form our project data:

1. Is the oxygen prescribed on the drug chart?
2. Has oxygen been appropriately signed for in the last 24 hours?
3. Was the patients last oxygen saturation within the target range?

Our data was collected at approximately monthly intervals over a period of 16 months. During this time two trust-wide audits were completed. At the other time points data was collected from wards with a high number of patients receiving oxygen. These wards became our "target wards". They included the:

- Medical admissions unit
- Older persons admissions unit
- Surgical and trauma admissions unit
- Respiratory wards
- Thoracic surgery ward.

At our first data collection point we found that 74 patients were receiving oxygen therapy within the hospital (not including accident and emergency department). 44.4% of patients receiving oxygen had a valid prescription. Of the patients who were receiving oxygen therapy with target ranges indicated, three were >2% above the

target range, placing them at serious risk of type 2 respiratory failure. Oxygen was signed for by nursing staff on 26.6% of drug rounds. 61.8% of patients were within their target range.

Design

We have had several interventions throughout the year. We adopted a continuous data collection utilising several plan, do, study, act (PDSA) cycles to trial these interventions. These have included educational interventions such as posters on "How to sign for oxygen" provided to wards to prompt correct administration and titration of oxygen. We have aimed to engage pharmacists with meetings to discuss oxygen prescriptions. A "top down" approach was trialled, with discussions with ward sisters on both medical and surgical wards at their monthly meetings.

We presented to the Foundation Year One, Foundation Year Two, and core medical (CMT) trainees about oxygen prescription and administration. We engaged with safety programmes already in place within the hospital by the addition of oxygen prescribing onto the clinical risk register and through the submission of incident reports for patients with oxygen not prescribed. Oxygen therapy formed the trust-wide patient safety brief for the month of March 2014. We also produced oxygen safety hangers which highlighted the importance of oxygen prescription, administration and titration. These were trialled after previous data showed their successful use in another hospital.

Strategy

PDSA cycle 1: For the first PDSA cycle we targeted education. We spoke to junior doctors in their FY1, FY2 and CMT teaching. We explained the benefits of oxygen prescription. We also disseminated a trust-wide report of our initial baseline data.

PDSA cycle 2: This cycle aimed to engage a wider audience including the nursing staff as we found that following PDSA one the rate of oxygen prescription rose then promptly fell back to baseline. We produced a trust-wide safety briefing which went to all staff to promote oxygen prescription and safety. This cycle had a large effect on the number of nursing staff signing for oxygen on the drug chart.

PDSA cycle 3: Here we aimed to engage the senior nursing staff and pharmacist to try to activate a top-down change to the system. We presented at medical and surgical meetings as well as pharmacist group meetings. We also included oxygen prescription on the trust risk register.

PDSA cycle 4: We introduced oxygen hangers, an idea from another quality improvement report from a hospital in London. We attached laminated hangers to the oxygen points coming out of the walls to act as a visual reminder.

PDSA cycle 5 and continuation of the project: The project has now been identified by one of the respiratory consultants as a important patient safety risk and will be taken forward by her into the future.

Post-measurement

Over the period of the project oxygen prescriptions rose from 44.4% to 76.9%. Oxygen signatures of drug rounds rose from 26.6% to 60% and the number of patients achieving their target range rose from 61.8% to 76.7%.

Prior to PDSA cycle 4 and the introduction of the oxygen hangers just 58.8% of patients receiving oxygen were within their target range. Following the use of the oxygen safety hanger 76.9% of patients who were receiving oxygen had it prescribed. Of these patients 76.7% had saturations within target range. Within a 24 hour period 60% of prescriptions were signed by nurses on each drug round. A full breakdown of the data can be seen in the supplementary materials.

See supplementary file: ds5173.pptx - "Oxygen Safety Flow Charts"

Lessons and limitations

Oxygen therapy provides different challenges to other drugs given to patients in hospital. The "dose" required can frequently change, the consequences of "overdose" are poorly understood and the importance of adequate oxygen monitoring is underestimated. We feel there are several limitations to the project and have several ideas for how oxygen safety can be further improved in the trust.

We feel the current drug chart is too complicated to allow staff to quickly prescribe and document adequate monitoring of oxygen therapy. Electronic prescribing will hopefully simplify this in the future where staff are required to enter current saturations and flow rate which will alert staff if a patient is not achieving their appropriate saturations.

We have been incredibly grateful for the support of the respiratory consultants throughout this project and the project is currently been taken forward by one of the consultants who is now responsible for oxygen therapy.

Conclusion

The multi-factorial nature of oxygen therapy provides several obstacles which prevent rapid changes to practice. Oxygen therapy affects all specialities across the hospital which results in multiple stakeholders. Two interventions in the year have been the most successful. Firstly the trust-wide safety briefing and secondly the oxygen "hangers".

This lends an important lesson in quality improvement; if other groups have shown an intervention to be successful in one hospital then this approach should be trialled, novel interventions are not always required to enact change in large organisations. The long term nature of this project has identified that a persistent approach is necessary to highlight this important aspect of patient safety. Secondly the trust-wide safety briefing enabled us to reach all stakeholders in one simple intervention ensuring the rapid dissemination of knowledge concerning oxygen safety.

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Declaration of interests

The authors have nothing to declare.

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Ethical approval

No ethical approval was required to carry out this project. The work was deemed to be a quality improvement study and local policy meant that ethical approval was not required.