NHS WALES

Estates and Facilities Alert

GIG CYMRU NHS WALES
Partneriaeth Cydwasanaethau
Gwasanaethau Ystadau Arbenigol
Shared Services Partnership
Specialist Estates Services

Llywodraeth Cymru
Welsh Government

Date: 9 April 2020

Cathays Park, Cardiff
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Use of high flow Oxygen therapy devices (including wall CPAP and high flow face mask or nasal oxygen) during the Coronavirus epidemic – urgent patient safety notice; immediate attention required

To: Chief Executives, LHBs
Chief Executives, NHS Trusts
NHS Wales Shared Services Partnership - Contractor Services

A list of people who need to have early sight of this information is given in the Alert

The content of Estates and Facilities Alerts is agreed between staff representatives from the four NHS administrations and issued throughout the United Kingdom. The Alert is endorsed by the Welsh Government as being relevant to NHS Wales and is issued by:

Neil Davies, Director, Specialist Estates Services, NHS Wales Shared Services Partnership

For advice see details on the alert

Note this alert originated in England by NHS Improvements.

NWSSP-SES Authorising Engineer (MGPS) has provided additional guidance on the risks associated with high oxygen flows through VIE systems and is attached for information.

Contact point in Wales:

Chris East
Senior Performance Standards Engineer
NHS Wales Shared Services Partnership – Specialist Estates Services
4th Floor, Companies House
Crown Way
Cardiff CF14 3UB

Estates and Facilities Alert

SES/EFA – 2020/001 Issued: 9 March 2020

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Summary

Letter to CEOs, Medical Directors, Critical Care Directors and Respiratory and acute medicine directors

Dear Colleague,

Revised guidelines around the use of non-invasive ventilation (NIV), and particularly continuous positive airway pressure ventilation (CPAP) were issued by NHS England / NHS Improvement on 26 March 2020. When considering how to implement these guidelines, please ensure that your estates team and clinical teams consider the following important safety issues about oxygen (O_2) flow and demand:

- CPAP delivery systems may have very different oxygen flow requirements – wall CPAP devices generally have much higher oxygen flow requirements than bedside machines
- The safe delivery of oxygen through wall outlets depends on:
    - the physical location of the outlet (critical care units, operating theatres and recovery areas usually have higher average potential flow rates – around 40 l/min – than normal wards – around 10 l/min);
    - the total piped oxygen demand within the hospital; and
    - the maximum outflow from the hospital's liquid oxygen storage tank, the Vacuum Insulated Evaporator (VIE). Modern VIEs with modern pipe systems can often produce around 3000L/min O_2, but older systems can produce as little as 1500 l/min O_2.
- **If the demand through multiple wall outlets exceeds the maximum capacity of the VIE delivery system, there is a risk of a rapid pressure drop in oxygen supply pipes. This could lead to a failure of oxygen delivery systems throughout the hospital, including to patients on face masks, CPAP, ventilators and operating theatres. There is also a risk of rapid and unpredictable depletion of the VIE. Both of these situations present a potentially significant risk to multiple patients simultaneously.**

As a result of this, some hospitals are using cylinders to increase O_2 supply on normal wards – there are significant patient and staff risks associated with this.

These issues are not normally a consideration for hospitals, as the majority of patients are on no oxygen or low-flow. However, during the Coronavirus epidemic, a far greater proportion of

patients will require O_2 therapy and ventilation, and this presents a clear and significant risk to oxygen delivery systems within hospital estates.

In order to mitigate this risk, please ensure that you take the following urgent actions:

- ensure liaison between clinical leadership and hospital oxygen engineering teams to ascertain:
    - the maximum flow rate from your VIE
    - the safest physical location to treat multiple patients on high flow O_2 or high flow support devices such as wall CPAP (i.e. critical care/theatres vs. ward)
    - any additional limitations to O_2 delivery owing to pipework architecture or potential modifications which could be made to improve O_2 delivery
- undertake a daily count of the number of high flow ventilatory systems where the potential O_2 flow rate exceeds 10 l/min (this would include most wall CPAP systems, High Flow Nasal Oxygen (HFNO) and many ventilators used in critical care units or operating theatres). This is particularly important as your hospital starts to receive additional invasive and non-invasive ventilators from the NHS supply chain or any other route
- calculate the maximum number of patients who can be treated with high flow devices such as wall CPAP and communication of this to the relevant clinical teams
- implement safety measures to prevent accidental O_2 system failure (such as limiting the number of these devices available for clinical use).
- work with your local medical oxygen engineering team to evaluate the potential for improving supply / flow dynamics of local O2 delivery to enable more patients to be managed on higher flow O2
- reduce / avoid reliance on cylinder O_2 to drive ventilators or to provide O_2 at permanent patient bedspaces. There are physical hazards associated with this, including trip hazards for staff and patients, and the risk of O2 supply running out without clinical staff being alerted.
- when cylinders are used and emptied, please ensure that they are promptly returned for refilling.
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Thank you in anticipation of your attention to this critical safety concern.

Yours faithfully,

Professor Ramani Moonesinghe, National Clinical Director, Critical Care

Professor Andrew Menzies-Gow, National Clinical Director, Respiratory Medicine

Mr Adrian Eggleton, National Estates Operational Lead and Covid-19 NHS Estates Lead

Action

Action by
CEOs,
Medical Directors,
Critical Care Directors and
Respiratory and acute medicine directors
Estates and Facilities Directors

Deadlines for action

Actions underway: ASAP

Enquiries

Enquiries should be directed to the Office quoting the alert reference number.

should be directed to the appropriate Regional Office quoting the alert reference number.

Wales

Enquiries and adverse incident reports in Wales should be addressed to:

NHS Wales Shared Services Partnership – Specialist Estates Services
4th Floor, Companies House, Crown Way, Cardiff CF14 3UB
Tel: 029 2090 4118 or E-mail: efa.ses@wales.nhs.uk

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Partneriaeth Cydwasanaethau
Gwasanaethau Ystadau Arbenigol
Shared Services Partnership
Specialist Estates Services

VIE Advice & Guidance

April 2020

Dear Colleague,

RISKS ASCOTIATED WITH HIGH OXYGEN FLOWS THROUGH VIE SYSTEMS

BACKGROUND

Due to the treatment of Covid-19 patients, it is expected that very high flows of oxygen will be required.

Management of Ventilators, or any Oxygen delivery device is key to optimise the efficiency of your pipeline system.

Health Boards/Trusts should be mindful that the VIE flow capacity is not the sole constraint on oxygen flow. The building pipeline system has a significant impact, particularly where ventilators or other oxygen delivery equipment is being used some distance away from the VIE installation.

Your Health Boards/Trust will have an Authorised Person (MGPS) and Authorising Engineer for medical gases: it is critical that clinicians and managers engage with their engineers and estates teams to plan their system surge capacity in order to safely care for patients.

The following information is intended to help maximize the efficiencies of your VIE installations, and limit the potential for VIE failure. Should you have further questions then please contact BOC directly for technical information.

Chris East (AE Medical Gas Pipeline Systems) can also be contacted for general information or assistance; chris.east@wales.nhs.uk.

RECOMMENDATIONS AND ACTIONS REQUIRED

The following measures should be implemented which will reduce the risk of an incident occurring.

VIE Line pressure increase

The maximum pressure you can achieve within the pipework is 4.5 bar by using the primary regulators.

Attempting to exceed this could result in regulator failure or regulators creeping to a higher level which would in turn increase the pipework pressure. This could initiate the common pressure fault alarm or worst case lifting the pipework pressure safety valve and diverting oxygen from the hospital.

On request BOC will send a technician to increase the primary regulators to 4.5 bar, leaving the secondary regulators at 3.7bar. This should preferably be completed as close to the expected peak flow as possible, not before.

If in the future the requests overload BOC capacity or BOC has too many technicians in self isolation, they will remotely talk APs' through this process on site.

Increases to vaporisers

Most systems are designed with two Starfin vaporisers for the primary supply, these are designed for an 8 hour duty cycle both manual or timed changeover, you will need to check your systems. If automatic leave them alone, if manual put procedures in place to manually switch on an 8-hourly basis. These must be sequenced every 8 hours so that one has a defrost cycle. Due to increased demand, de-icing with warm water or steam lances will be necessary on a regular basis.

Please note, **DO NOT** put both vaporisers on line at the same time, if both vaporisers are put on-line, it will **NOT** double the flow capacity, it actually **REDUCES** it. If you have already completed this task you may have seen an increase in flow initially, however flow **WILL** decrease over time.

If you are unsure of your set up or type of vaporisation system, send photographs to email: cescsc@boc.com or call 0800 222 888. BOC will check this against their records and advise accordingly.

If your site has the older tubular evaporators these are designed for different constant flows, please contact BOC (as above) to discuss options.

The system back up vessel usually only has a single vaporiser, **DO NOT** increase the pressure to meet the primary.

The system back up is sized for 24 to 48 hours at the Hospitals **AVERAGE** flow

The back-up system **CANNOT** achieve 3000LPM, and should be left alone to act as the back-up system.

Liquid Oxygen carry over

BOC have stated their maximum flow capacities through their equipment, which will be different per site, and per VIE. However the actual flow that their systems can deliver

could exceed this.

Great care and monitoring of the VIE installation must be carried out during peak flows, as your distribution system could pull excessive flows through the vaporiser and control panel. This excessive flow above the stated BOC maximum figure could lead to Liquid Oxygen being pulled through your control panel and into the distribution line if not managed.

Access to BOC's telemetry website will help monitoring of flows, please contact BOC directly to gain access.

This telemetry data can be used to check flow rates from the VIE to give you an idea of the oxygen being pulled from the VIE at any time. This will enable you to see if you are getting close to maximum flow rates and also to confirm whether the site modelling of demand based on predicted oxygen demand is accurate.

Management of the Oxygen flows from site is key during this time, so you can inform your respective leads that maximum demand has been reached, and no additional Oxygen should be supplied via the piped system.

If liquid carry over through the control panel occurs and is left to continue, catastrophic failure of the control panel could occur leading to a total loss of Oxygen supply to the site.

Tell-tale signs of liquid Oxygen carry over

The low pressure alarm will activate potentially due to liquid in the line not gas

The pipeline after the evaporator feeding into the control panel will ice up

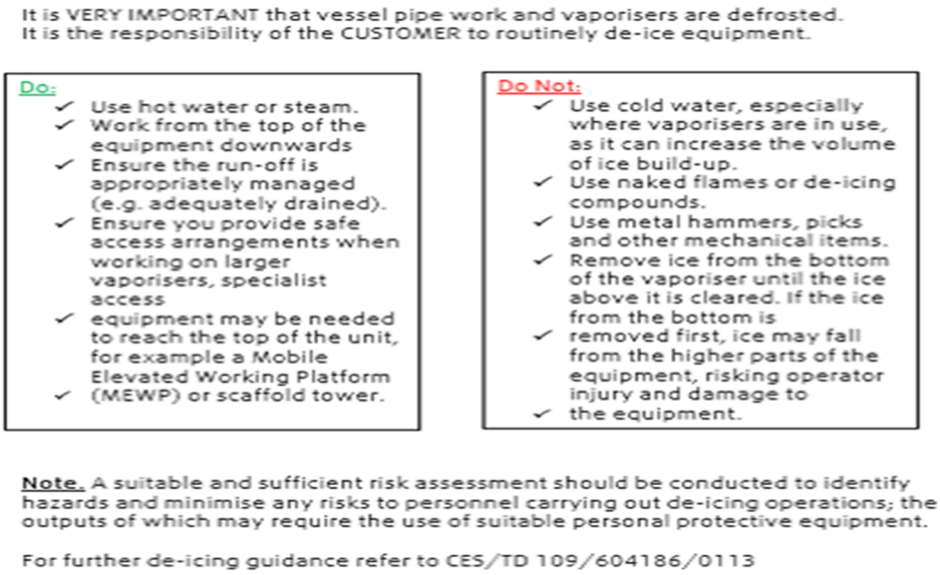
Increased condensation forming inside the control panel will also occur.

De-icing of Evaporators

During this period of increased demand for Oxygen, you vaporisers will significantly ice up at a greater rate than normal, the closer you get to peak flows you should consider hourly observations, and de-ice as appropriate.

The more ice you remove, the more efficient the system will be, but please be aware that you may use cold water under normal flows to routinely de-ice, however under higher demand the advice would be to use warm water or even steam lances.

The picture below from BOC highlights the Do's and Don'ts with respect to de-icing.



Further Ad-hoc requests

Any ad hoc requests should be directed to the Healthcare co-ordinator: Paul Shorter (paul.shorter@boc.com)

Alternatively, email cescsc@boc.com or call 0800 222 888 and BOC will your pass on your request for review. e.g.

Requests for vaporisation rates of the system

Excessive icing of the vaporisers due to increase in demand etc.

System and equipment considerations

Oxygen usage varies widely depending upon type of clinical use and varies significantly depending on the medical devices being used.

Estimated flow rates need to be sought from specialist clinicians for each type of device and what the likely flow rate is in real time use.

Please note that flow rates will likely be estimates of likely in use flow rate. They need to be verified in real time operation. Consult with clinical teams and EBME locally to confirm actual operational equipment flow rates, ensuring you are updated on actual oxygen usage.

Any enquiries on the content of this letter should be addressed to Chris East, Authorising Engineer, Medical Gas Pipeline Systems on 029 2090 4102 or e-mail chris.east@wales.nhs.uk.

Yours sincerely,

C. East, BEng (Hons)
Authorising Engineer Medical Gas Pipeline Systems.
NWSSP Specialist Estates Services, 3rd Floor, Companies House, Crown Way, Cardiff CF14 3UZ