

Oxygen Conservation In Critical Oxygen Shortages

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Acknowledgement

The basis for these strategy recommendations came from the Minnesota disaster preparedness plan. It has been modified by the Wisconsin State Expert Panel on Ventilator Surge Capacity.

Critical Oxygen Shortages

Individual hospitals have plans in place to increase their oxygen supplies in the event of increased use

Usual response time for requests is ≤ 24 hours

A pandemic or other disasters may create needs from several different hospitals at the same time and may prevent the normal replenishing of oxygen thus creating a critical shortage

Potential Trigger Events

Internal Disruption of Hospital Medical Gas System

Internal Surge to Hospital Capacity

External Notification by Gas Supplier of Delays or Shortages

External Notification by State Department of Health of an impending pandemic

Upon State Declaration of Emergency

Monitor Use and Revise Clinical Targets

Monitor Use

Employ oxygen titration protocols to optimize flow or % to match targets for SPO₂ or PaO₂

Optimization of flow will minimize overall oxygen use

Discontinue oxygen at earliest possible time

Monitor Use and Revise Clinical Targets

Revise Clinical Targets

<u>Starting example</u>	<u>Initiate O₂</u>	<u>O₂ Target</u>
Normal Lung Adults	SPO ₂ <89%	SPO ₂ = 90%
Infants & Peds	SPO ₂ <90%	SPO ₂ = 91-94%
COPD History	SPO ₂ <88%	SPO ₂ = 90%

Note: Targets may be adjusted further downward depending on resources available, the patient's clinical presentation, or measured PaO₂ determination

Discontinue High-flow Applications

Restrict the use of high-flow adult cannula systems, such as Vapotherm® or AquaNox®

Restrict the use of Simple Mask and Partial Rebreather to 10 lpm maximum

Restrict the use of gas injection nebulizers as they generally require 10-75 lpm

Eliminate the use of gas-powered venturi

suction systems

Substitute Oxygen Conservation Devices

Optimzer®-type cannulas may be used at ½ the flow setting of standard cannulas
Replace simple mask and PRB Mask use with Optimzer cannulas at flow rates of 6-10 lpm

Substitute available Oxygen Concentrators if Electric Power is Present

If hospital-based or independent home medical equipment supplier oxygen concentrators are available, use them to supplement low-flow cannula use, and preserve the primary supply for more critical applications.

Use concentrators or other low-flow options (cylinders) to provide low-flow oxygen (when needed) to ventilators that are equipped with low-flow options.

Substitution of Inhaled Medications

Minimize frequency through medication interchanges that result in fewer treatments (Q6-Q12 hour applications vs. Q4 hr)

Restrict the use of small volume nebulizers (SVN) when inhaler substitutes are available in MDI or DPI form

Restrict continuous nebulization therapy

Use clinical air or compressors to power small volume nebulizers when needed.

Restrict the use of Air-Oxygen Blenders

Eliminate the low-flow reference bleed that occurs with any low-flow metered oxygen use. This can amount to up to an additional 12 lpm.

Reserve air-oxygen blender use for mechanical ventilators that use high-flow non-metered outlets. (These do not use reference bleeds).

Disconnect blenders when not in use.

Reuse of Expendable Oxygen Appliances

Oxygen appliances, small and large bore tubing, and ventilator circuits may be terminally sterilized or treated with high-level disinfection procedures. Bleach concentrations of 1:10, high level chemical disinfection, or irradiation may be suitable if available to hospitals. ETO gas sterilization is optimal, but requires a full 12 hour aeration cycle to prevent ethylene chlorhydrin formation with PVC plastics.

Departments should consult their sterile processing/re-processing and Infection Control departments prior to shortages to establish plans to implement the above recommendations.

Oxygen Re-Allocation Implementation

Patients may be prioritized and subject to triage protocols for oxygen administration with severe resource limitations.

Example: Patients requiring ≥ 3 lpm for >72 hours would have their oxygen removed.

Patient Aggregation

Concentrate oxygen dependant patients in specific areas of the facility to allow shut-down of the piping systems in the non-utilized areas. This will reduce oxygen loss due to leaks and will allow for the back-feeding of these areas if necessary.

Maintenance

Routine maintenance should be performed on piping systems to prevent oxygen loss due to leaks.

Conclusion

Hospitals need to have a plan in place prior to an event in order to protect patients and staff and insure fair and ethical distribution of scarce resources

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