Consensus Conference on Artificial Airways in Patients Receiving Mechanical Ventilation

It has long been known that patients with respiratory failure requiring prolonged mechanical ventilation consume considerable hospital resources. Reimbursement for these costs in the elderly by the Prospective Payment System (PPS) has been found to be severely lacking. In an attempt to reduce the vast differences between hospital costs and the paucity of reimbursement for this group of patients, the Health Care Financing Administration (HCFA) added two new DRGs in late 1987. DRG 474 applied to MDC4 (Major Disease Category 4: Respiratory System) patients receiving mechanical ventilation through a tracheostomy tube, whereas DRG 475 applied to similar patients receiving mechanical ventilation through an endotracheal tube. The weighting factors for DRGs 474 and 475 were 11.8772 and 3.1757, respectively, the former one of the highest weighting factors in the PPS.

Even though the new DRGs represented a significant improvement, at least three major problem areas remained. The first concerned the fact that the weighting factor for DRG 474 was so high that there might be undue pressure placed on physicians to perform tracheostomies prematurely on these critically ill patients. Second, there were no guidelines available on the timing of performing tracheostomies on intubated patients receiving mechanical ventilation. Third, the majority of patients requiring prolonged mechanical ventilation did not have a principal diagnosis falling into the MDC-4 category and therefore would not be covered by the new DRGs.

To address these and other issues, a consensus conference was organized by the National Association of Medical Directors of Respiratory Care (NAMDRIC). The following consensus statements developed by those scientists attending the conference should favorably affect the quality of patient care, suggest areas for future research, and should influence the development of future reimbursement policies concerning patients receiving mechanical ventilation through artificial airways.

Indications for Placement of Nasal and Oral Endotracheal Tubes

Introduction

Tracheal intubation is indicated for (1) maintenance of airway patency, (2) protection of the airway from aspiration, (3) facilitation of secretion clearance, or (4) provision of mechanical respiratory support. Because these indications encompass a broad range of pulmonary and nonpulmonary diseases, it is inappropriate to list specific diagnoses for which intubation is indicated.

Tracheal intubation should be performed by personnel who are sufficiently skilled to provide optimal care. Institutions should credential personnel who perform intubation in a manner appropriate for the size and complexity of the facility and the medical staff. Credentialing should include consideration of training, experience, and backup personnel.

Certainly, intubation in some patients will not improve the outcome because of the severity of the primary disease process or comorbid conditions. One of the crucial tasks facing physicians and society over the next few years is the identification of such patients and the establishment of the ethical, social, and medicolegal environment in which the decision not to intubate can be made when appropriate.

Problems or Deficiencies

The problems and deficiencies related to tracheal intubation reflect the lack of sufficient data to resolve many of the long-standing questions surrounding the procedure, its complications, and appropriate duration of translaryngeal intubation. The following problems are identified:

1. There has been insufficient definition of the characteristics of personnel credentialled to perform intubation and the adequacy of their ability to perform alternative forms of ventilation including, but not limited to, bag-and-mask ventilation.

2. Contraindications, relative and absolute, to translaryngeal intubation in general and to nasal or oral intubation in particular require additional clarification. These include such relative contraindications as coagulopathy with nasal intubation and anatomic factors that preclude use of either or both routes.

3. The optimal size of translaryngeal tubes has not been defined. No data are available to permit selection of the endotracheal tube size that provides the best function with the least risk of patient injury.

4. The complications of tracheal intubation require quantitation and analysis. These include trauma, nosocomial infection, mechanical problems including tube displacement, the risk of aspiration, and physiologic problems such as interference with tracheal mucosal function.

5. The appropriate duration of translaryngeal intubation remains controversial. No data permit adequate characterization of a maximal duration of translaryngeal intubation.

6. There has been insufficient attention to aspects of alternative design of artificial airways.

7. Attention must be directed to the ethical questions related to the appropriate utilization of tracheal intubation in patients for whom therapy may be futile.

Recommendations

Although there are no easy answers to many of the above problems/deficiencies, several may be amenable to improvement. The following suggestions are offered:

1. Rigorous credentialing of personnel who perform tracheal intubation should reduce the incidence of complications secondary to inappropriate tube placement, excessive
trauma, aspiration of stomach contents, etc.

2. Effectively trained and credentialed personnel should recognize relative and absolute contraindications and avoid complications related to those factors.

3. The choice of the size of translaryngeal tubes should be individualized. In general, smaller tubes produce less laryngeal damage and less nasal trauma than larger tubes, but may increase resistance to gas flow and may require greater cuff inflation. In contrast, larger tubes facilitate suctioning and bronchoscopy, may permit lower cuff pressures, and may be less likely to become obstructed by secretions.

4. The following complications of tracheal intubation could possibly be reduced. Trauma could be diminished by appropriate training and credentialing. Nosocomial infection could be reduced by rigorous sterile technique during suctioning. Mechanical problems, including tube displacement, could be limited by compulsive postintubation physical examination and application of monitoring techniques such as capnometry and oximetry. Physiologic problems such as insufficient humidification and cuff overinflation require adherence to established protocols. The risk of aspiration of stomach contents may be limited by appropriate selection of the route and technique of tracheal intubation, as well as the appropriate use of sedatives and muscle relaxants to facilitate intubation.

5. The appropriate duration of translaryngeal intubation cannot be defined at present. Clinical consideration or complications may dictate changing the artificial airway to another route. However, no data exist that give adequate direction as to when it is routinely advisable to change from a translaryngeal intubation to a tracheostomy.

6. There are no imminent changes in the design of artificial airways that promise to alter current clinical practice.

7. To help resolve ethical questions related to the appropriate utilization of tracheal intubation in patients for whom therapy may be futile, an institutional ethics committee or its equivalent could be established to provide advice and support for the care providers, the patients, and their families.

**Research Opportunities**

The following areas are identified in which new data could be timely and cost-effective.

1. A multicenter cooperative study comparing nasotracheal intubation with orotracheal intubation should be performed.

2. A multicenter cooperative study comparing long-term tracheal intubation to early conversion to tracheostomy should be performed. This study, in conjunction with the first study could, if appropriately designed, better define the indications, limitations, and complications of each of the various routes of airway management.

3. Although difficult to design, a study that addressed the social, ethical, and medicolegal aspects of withholding futile therapy could benefit patients, families, and care providers.

4. Continued research and development of alternative airway devices may improve care.

5. Investigations should continue into techniques that might limit the incidence of nosocomial infections related to artificial airways.

**INDICATIONS FOR PLACEMENT OF TRACHEOSTOMY TUBES**

**Introduction**

Tracheotomy is a valuable adjunct to continued mechanical respiratory support. Ideally, tracheotomy should be performed or directly supervised by an experienced surgeon with an anesthesiologist in attendance in an operating room or appropriately equipped critical care setting. Personnel should be experienced in its performance and knowledgeable in tracheotomy after care to minimize complications.

**Benefits**

Tracheotomy has several benefits in the patient receiving mechanical respiratory support. The decision to perform a tracheotomy is determined by weighing the benefits and risks of the procedure. The benefits include:

1. Sparing further direct laryngeal injury from the translaryngeal tube;
2. Facilitating nursing care, specifically airway suctioning and mouth care;
3. Increasing patient mobility by providing a more secure tube;
4. Facilitating transfer from the ICU setting;
5. Improving comfort;
6. Permitting speech;
7. Facilitating oral nourishment; and
8. Providing psychologic benefit.

**Disadvantages**

Disadvantages include: (1) cost of the procedure; and (2) complications attributable to the tracheotomy.

The committee recognizes that there is no specific time at which a translaryngeal tube must be removed and a tracheotomy performed. The decision to convert to tracheotomy must be based on individual patient factors, including anticipated degrees of improvement or deterioration over time.

**Recommendations**

The following guidelines are recommended:

1. For anticipated need of the artificial airway up to 10 days, the translaryngeal route is preferred;
2. For anticipated need of the artificial airway for greater than 21 days, tracheotomy is preferred;
3. When the time anticipated for maintenance of an artificial airway is not clear, daily assessment is required to determine whether conversion to tracheotomy is indicated;
4. The decision to convert to tracheotomy should be made as early as possible in the course of management to minimize the duration of translaryngeal intubation. Once the decision is made, the procedure should be done without undue delay, except in circumstances such as life-threatening cardiopulmonary instability, uncorrected coagulopathy, or other mitigating circumstances.

**Research Opportunities**

Existent deficiencies in our understanding motivate the need for further research. These include studies that:
1. Prospectively quantify the effect of intubation duration on the degree of laryngotraheal injury in humans;
2. Prospectively quantify tracheotomy-related infection of the injured larynx;
3. Develop a reliable scoring system that would predict a given patient's need for continued airway support;
4. Determine the incidence of nosocomial infection after tracheotomy; and
5. Quantify issues of comfort, psychologic benefit, and nursing care as it relates to an endotracheal tube or tracheotomy.

Implications for Reimbursement for Patients Receiving Mechanical Ventilation

An appropriate reimbursement system for patients on mechanical respiratory support should be based on goals that it: (1) encourage appropriate quality of patient care; (2) encompass all patients; and (3) avoid over/underutilization of healthcare resources.

Problems

1. The present Medicare reimbursement system (DRGs 474 and 475) is limited to a small percentage of patients who require mechanical respiratory support since the system only recognizes assignment to MDC 4 (Major Disease Category 4: Respiratory System).
2. DRG 474 utilizes tracheotomy as the determining factor in DRG assignment/reimbursement. The higher reimbursement of this DRG creates a financial incentive to perform the procedure.
3. Patients receiving mechanical respiratory support utilize a high proportion of healthcare resources.

Recommendations

1. DRGs 474 and 475 should be discontinued.
2. A new DRG for patients receiving mechanical respiratory support should be established without regard to MDC.
3. This new DRG should apply to patients requiring mechanical respiratory support for a total of 5 or more days during a hospitalization. This will require that the number of days of mechanical respiratory support be appropriately recorded for DRG purposes. Logic dictates that such a DRG would have a relative weight between the existing weights for DRGs 474 and 475.
4. Appropriate levels of healthcare resource utilization for patients receiving mechanical respiratory support could be established, e.g., intermediate care areas.

Resource Opportunities

Recommendations for research include the following:
1. Available data should be analyzed to validate the medical and fiscal appropriateness of the five or more days ventilator requirement for the new DRG.
2. Existing data should be analyzed and new data developed to establish the feasibility and optimal design of intermediate care units.

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REFERENCES

2. Douglass PS, Bone RC, Rosen RL. DRG payment for long-term ventilator patients. Chest 1987;91:413-17

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Physiologic Implications of Artificial Airways*

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It has been appreciated for some time that bypassing the upper airway with a tube will increase the resistance to airflow.1 As a result, the work of breathing will be increased since a greater pressure will be necessary to generate a particular airflow.2,3 To understand better those factors which determine the resistance to flow through tubes,4,5 some knowledge of fluid mechanic principles is required. The easiest system of tubes to study is that of flow in long, straight tubes for which much experimental and theoretic

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