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Overtreatment in threshold and developed countries

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ABSTRACT

In acute paediatrics, overtreatment and overdiagnosis is encountered in threshold and developed countries. The foundation of overtreatment may be similar in the two settings, namely the mere availability of invasive procedures, which may lead to their inappropriate use. Physiological healing processes should be integrated in treatment plans. Whenever possible, natural organ functions should be maintained (e.g. enteral instead of parenteral nutrition). Standards and guidelines may assist the paediatrician in weighing up the benefits and risks of available invasive diagnostic and therapeutic procedures. Safe and simple methods, successfully introduced in countries with limited resources, are equally useful in the industrialised world, as they have the potential to reduce the application of risky invasive therapies.

INTRODUCTION

Overtreatment and overdiagnosis is the application of unnecessary, excessive or ineffective medical procedures or drugs. These measures do not improve the outcome of the patient. On the contrary, the patient is exposed to the risks inherent in any procedure and may be harmed.¹

Overdiagnosis has been defined as sticking a healthy or nonseriously ill patient with a serious diagnosis.² Overinvestigation is part of overdiagnosis.² Overdiagnosis may lead to prolonged hospital stay and unnecessary treatment.² For this review, overtreatment is used as the generic term, comprising also overdiagnosis.

The money spent for the unnecessary measures themselves and the treatment of the complications, they caused, is a burden to the health budget. If financial and human resources are scarce, they are thereby channelled away from other clinically relevant issues.³ Areas of overtreatment have to be found by outcome-studies comparing potential unnecessary procedures with simpler approaches.⁴ The reasons for overtreatment have to be evaluated and measures against overtreatment have to be implemented.¹ I will show that overtreatment in acute paediatrics may be a extensive problem, and then discuss, how it has arisen and how it might be addressed.

OVERTREATMENT IN THRESHOLD COUNTRIES

Based on economic criteria, the United Nations publishes a list of developing, transition (threshold) and developed countries.⁵ In the context of this review, threshold countries are defined as follows: public hospitals in these regions have access to a moderate range of drugs and some invasive procedures such as mechanical ventilation, but health personnel lacks adequate training for their focused application and some equipment is outdated, poorly functioning or unsafe.^{2 6 7}

Overdiagnosis and overtreatment may be a problem specific to threshold countries. This has been shown for the Commonwealth of Independent States² and Central and South America:⁷ in a recent assessment of hospitals in Kazakhstan, the Republic of Moldova and the Russian Federation, it was found, that children received excessive and ineffective treatment and several conditions were overdiagnosed, especially neurologic disease;² in six paediatric intensive care units in Mexico and Ecuador, endotracheal intubation and central venous cannulation were associated with increased mortality in low-risk admissions.⁷ What about the developed world?

OVERTREATMENT IN DEVELOPED COUNTRIES

There is much evidence for overtreatment in the developed communities. In a retrospective study of infants with RSV infection admitted to intensive care, the short-term outcomes with invasive monitoring versus a less interventional approach during two sequential periods were analysed.⁸ In the second period, invasive monitoring was minimized in favour of clinical assessment and noninvasive techniques: there were less central venous, arterial and urinary catheters and there was decreased

laboratory testing and decreased use of neuromuscular blocking agents, antibiotics, parenteral nutrition, inotropic drugs and blood products. However, the less invasively treated group had a shorter intensive care unit stay, less episodes of bacteremia, the same mortality and less total hospital charges.⁸ Another retrospective study showed that the perceived need for supplemental oxygen therapy based on pulse oximetry readings prolonged hospital stays in RSV patients who otherwise met all discharge criteria.⁹ In a neonatal intensive care unit the presence of arterial catheters led to increased blood drawing and raised the frequency of blood transfusions, thereby exposing neonates to, probably, unnecessary risk (viral transmission, blood group confusion, depression of erythropoiesis, storage lesion of red blood cells).¹⁰ In addition to increased blood loss and catheter related infections, invasive monitoring, especially with central venous lines, has risks associated with line insertion (e.g. inadvertent arterial puncture, pleural effusion and nerve injury, risks of anaesthesia). In children with mild disease, these risks may outweigh the benefits of invasive monitoring. In a neonatal unit, it has been found, that infants exposed to higher infant to staff ratios had an improved adjusted probability of survival to hospital discharge, possibly because these small, unstable infants were exposed to less handling by nurses.¹¹ Recently, Lacroix *et al* showed, that the haemoglobin threshold for transfusion could be safely lowered to 7 g/dl in stable critically ill children without increasing adverse outcomes,¹² and Kneyber *et al* even concluded from their retrospective study that red cell transfusion in critically ill children was independently associated with increased mortality.¹³ Areas of overdiagnosis in general paediatrics are food allergy,¹⁴ attention-deficit hyperactivity disorder (ADHD),¹⁵ IgA-deficiency,¹⁶ dyslexia¹⁷ and normal growth variants.¹⁸

HOW HAS THE PROBLEM OF OVERTREATMENT ARISEN IN THE DEVELOPED WORLD?

The input of medical care is enormous. Does more care equate to better outcome? There is substantial benefit from minor inputs in a underdeveloped system: in rural Papua New Guinea, the introduction of oxygen for the treatment of severe pneumonia resulted in a major decrease in childhood mortality.¹⁹ However, with increasing inputs, the „law of diminishing returns“ suggests that, after a certain point, additional inputs may provide decreasing additional benefit and that there may be a point at which additional growth will actually cause harm.¹ The paediatrician has the choice of an increasing range of diagnostic and therapeutic techniques and drugs. Partially, this is fostered by the industry.²⁰ Once available, these diagnostic and therapeutic procedures may be used inappropriately and may cause harm by: identifying abnormalities that are not actually causing problems; pressurising clinicians to treat conditions that are asymptomatic; confusing clinicians by the complexity of the diagnoses and by channelling resources away from other clinically relevant issues.¹ Increased complexity of care alone may be responsible for increased numbers of critical incidents, as physicians are more likely to miss important issues and the system becomes more liable to error.²¹ The availability of diagnostic tests may decrease clinical skills and thus, in a vicious circle, further increase the application of potentially risky invasive diagnostic procedures.²² Continuing specialization may lead to a lack of generalists in hospitals,²³ who coordinate and even refuse specialists' recommendations for diagnostic or therapeutic procedures in view of a comprehensive benefit/risk evaluation. At least for paediatric intensive care, this has been shown. The appointment of intensivists, reduced ICU resource use and improved outcome.^{24 25}

Insurance status, fee schedules and socioeconomic factors might be further determinants of how much medical treatment is given to a patient. The inappropriate use of diagnostic and therapeutic procedures is sometimes triggered by financial incentives. Fee schedules that reward higher-intensity specialities and practice styles compared to general practitioners lead to increasing intensity of care.²⁶ In Switzerland, it has been shown that privately insured adults had the highest rates of surgical procedures (hysterectomy, gallbladder, hip).²⁷ Wealthy people have greater access to care, are more likely to receive the more intensive care offered by specialists,²⁸ and are more likely to undergo invasive procedures.²⁹ In children, emergency department visits have been examined. A study conducted in the USA showed that children with private, non-HMO insurance were more likely to visit the emergency department for non-urgent problems than children with HMO insurance.³⁰ This leads to potential overtreatment. A study on diagnostic and treatment behaviour in children with chronic respiratory symptoms in the UK points in the same direction: in the least deprived areas, children without significant asthma symptoms were more likely to be on inappropriate medication.³¹ On the other hand, in the USA it has been shown that non-white groups had a higher risk of dying after paediatric congenital heart surgery than whites.³² This disparity was not influenced by insurance type. The authors concluded that the higher mortality of non-white groups was due to their reduced access to care, that is undertreatment. Therefore, the consequences of different access to care may also depend on the specific disease.

HOW MIGHT THE PROBLEM OF OVERTREATMENT BE ADDRESSED?

One of the greatest opportunities to improve patient outcomes comes not from discovering new treatments, but using existing therapies more effectively.³³

In clinical paediatrics, the education and appointment of generalists and case managers may prevent patients from being overtreated. This has been shown for paediatric intensive care, where the change from an open unit (patient care is the responsibility of the admitting services) to a closed format (appointment of a dedicated paediatric intensivist and 24 hour coverage by a intensive care team) resulted in a decrease in admissions with very low severity of illness and a decrease in the illness-adjusted mortality.^{25 26} Intensivists have become the general practitioners of acute care. They have adopted multidisciplinary collaboration, contributed to systems management within intensive care, and emphasised intervention at the first signs of clinical instability.³⁴ Physiological healing processes should be integrated in treatment plans. In neonatology, the „minimal handling“ concept has been shown to be more successful than more aggressive approaches.¹¹

³⁵ Whenever possible, natural organ functions should be maintained. Enteral feeding is considerably safer (and cheaper) than intravenous alimentation.³⁶ Prolonged intravenous feeding and lack of enteral nutrition leads to intestinal mucosal atrophy, infections and liver disturbance.³⁶ The maintenance of normal body temperature has often been an end point for the use of paracetamol. Some studies now suggest that fever may have a beneficial role in infection,³⁷ and the World Health Organisation recommends that antipyretics be withheld in bacterial sepsis.³⁷ Normalizing physiological variables in acute illness, such as fever in sepsis, hypercapnia in

reperfusion injury or acute respiratory distress syndrome (ARDS) and low blood pressure in trauma and potential bleeding may be hazardous.³⁸

The establishment of standards and guidelines may assist the paediatrician in weighing up the benefits and risks of available invasive diagnostic and therapeutic procedures and may thus prevent overtreatment. Guidelines may be a means of reducing physician practice variability.³⁹ Interventional studies have shown that guidelines and carepathways can reduce the amount of diagnostic and therapeutic procedures, error rates and improve outcome. In neonatology, intubation time and length of stay decreased after standardisation of pain management.⁴⁰ The rate of infection with coagulase-negative staphylococcus decreased in 6 neonatal intensive care units after implementation of guidelines aimed at prevention of nosocomial infection.⁴¹ Part of these guidelines were instructions for less treatment such as minimising the use of central lines, intubation days and intravenous nutrition.⁴¹ After the implementation of an evidence-based guideline for the management of hospital-based bronchiolitis, length of stay and resource use (nebulizer treatment, steroids, oxygen, antibiotics, radiographs, blood gas testing) decreased significantly.⁴² Basically, this guideline advised against unproven, unnecessary procedures (overtreatment), such as routine chest radiographs, routine blood gas analyses or steroid inhalations. In an adult intensive care unit, the number of blood gas analyses decreased significantly after the implementation of a corresponding guideline.⁴³ Length of stay and mortality remained unchanged, whereas savings were enormous.

Areas lacking evidence-based guidelines are particularly prone to overtreatment. One such clinical problem is the indication for blood transfusion in neonatology. This is

reflected in major differences in transfusion practices between different neonatal units.¹⁰

WHAT CAN THRESHOLD AND DEVELOPED COUNTRIES LEARN FROM EACH OTHER REGARDING OVERTREATMENT?

The studies on overdiagnosis and overtreatment and its negative impact on patient outcome in threshold countries,²⁷ may sharpen our understanding of this problem in health care and we have realized that overtreatment is also present in developed countries. Even the foundation of overtreatment may be similar in the two settings, namely the inappropriate use of available invasive procedures and knowledge.

However, the investigation of the practice of medicine in threshold countries may not only sharpen our sense for similar problems in the developed world, we can also learn in a positive way by adopting methods successfully used in these countries.

Obviously, some threshold countries have a much better relation between total health expenditure per head and outcome (here life expectancy at birth):⁴⁴ e.g. Switzerland spends five times as much as Costa Rica or Sri Lanka, but life expectancy in all three countries is more or less the same. So what can developed countries learn from poorer ones? There are a lot of excellent projects⁴⁵ with the common characteristics of keeping interventions simple.⁴⁶ To give an example from acute paediatrics: the World Health Organisation recommends the use of nasal prongs and nasopharyngeal catheters as a safe and efficient means of oxygen administration.¹⁹ It has been shown, that these methods produce positive end-expiratory pressure (PEEP).⁴⁷ The level of PEEP is safe and a welcome by-product because it may contribute to an

improvement in oxygenation by altering the viscoelastic properties of the lung. The attributes „safe“ and „efficient“ are especially important in countries with limited resources for patient monitoring, equipment and supplies, such as medical oxygen. However, safe and simple methods are equally useful in the industrialised world as they have the potential to reduce overtreatment.⁴⁶

The “WHO guidelines for the management of common illnesses with limited resources”⁴⁸ equally apply to the management of most clinical situations in developed countries. Examples of unnecessary, invasive therapies according to these WHO guidelines are tracheal intubation and mechanical ventilation rather than nasal prong oxygen in moderate respiratory disease, intravenous rehydration rather than oral rehydration in some dehydration and intravenous antibiotics rather than oral antibiotics in less severe chest infections.⁴⁸ An example of an unnecessary, risky diagnostic procedure is the routine practice of neuroimaging (often under general anaesthesia) rather than a careful history and clinical examination in children with seizures.^{4 48}

CONCLUSION

In acute paediatrics, overtreatment and overdiagnosis is encountered in threshold and developed countries. Reasons may be the mere availability of invasive procedures, which may lead to their inappropriate use, further triggered by financial incentives and insurance status. Standards and guidelines may assist the paediatrician in weighing up the benefits and risks of invasive procedures. Most

clinical situations in developing as well as developed regions can be safely managed by simple methods, based on careful history taking and clinical examination, taking into account the physiological healing processes and maintaining the natural organ functions.

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