

## Sex in the ICU: Eliminating Genderbased Disparities in Care

**Table 1. Sex and Gender Differences Related to ICU Care**

Biology	Sex differences in disease prevalence and immune response
<b>Diagnosis</b>	Women are more often admitted with medical diagnosis and have higher rates of ARDS after critical injury, while men are more often admitted post elective surgery.
<b>ICU Stays</b>	Studies indicate higher rates of ICU admission for men, while women have a higher severity of illness on admission and shorter lengths of stay in the ICU.
<b>Interventions</b>	Women are less likely to receive common interventions including mechanical ventilation, pulmonary artery catheterisation, and central venous catheter insertion.
<b>Health Outcomes</b>	Women are at lower risk of contracting VAP. The literature on sex differences in mortality after ICU admission is mixed.
<b>Research</b>	Women are often under-represented in critical care research.

The time has come to apply a sex and gender lens to quality improvement in ICU care, considering not just biological differences but also potential gender bias from decision makers, among other factors. The authors of this article explore the current context of quality standards and indicators, and assess how access, quality and outcomes across genders can be optimised.

### Introduction

Great strides have been made throughout Europe and North America in improving the quality and outcomes of care in the intensive care unit (ICU). Quality improvement interventions, including the use of care bundles, have increased adherence to evidence-based guidelines for ICU care. Meanwhile, validated quality indicators—for example, rates of ventilator-associated pneumonia (VAP) and central venous catheter-related bloodstream infections—facilitate measuring and monitoring improvement in critical care settings (McMillan et al. 2007). The European Society of Intensive Care Medicine (ESICM) has released a set of consensus indicators assessing structure, process and outcomes of ICU care, to be used in improving the safety and quality of care provided to critically ill patients (Rhodes et al. 2012), whereas in the US, quality indicators relevant to ICU care have been endorsed by the National Quality Forum (National Quality Forum, 2003).

Indicators of ICU care have also become the focus of attention of regulatory bodies seeking to contain costs and improve quality and safety of hospital care. Some of these efforts have been controversial. (Pronovost et al. 2008)

In the US, indicators of ICU care have been included in accreditation standards of the Joint Commission on Accreditation of Healthcare (JCAHO, 2005). In Ontario, Canada, rates of VAP and central-line infections are publicly reported with the goal of encouraging hospitals to reduce often-avoidable complications (Ministry of Health and Long-Term Care, 2012). Performance on indicators of ICU care have been linked to financial incentives in the US and the UK. Since 2008, with Medicare as the payer in the US, hospitals have no longer been reimbursed for care related to a list of “preventable” complications (Centers of Medicare and Medicaid Services, 2007). In the UK, in 2008, the Commissioning for Quality and Innovation payment system (CQUIN) was introduced to link payment to hospitals with good performance (Department of Health, 2008).

### The Role of Sex and Gender

At the same time there is a growing body of literature on important sex- and gender-based differences related to critical care (Table 1), which could help to improve healthcare and patient outcomes. In this article, we define “sex-based differences” as biological differences which may influence disease patterns and responses to treatment, while “gender differences” relate to the social context, which influences health, social and economic resources, as well as access to and experiences with care. Animal studies have found sex-based differences in immune response, and clinical studies have suggested sex-based differences in sepsis incidence and response among critically ill patients (Fowler et al. 2009). Multiple studies have found gender-based disparities in ICU admission rates and care delivery patterns.

In other areas of medicine too, sex and gender differences in health and healthcare have been the focus of much attention. For example, sex-specific recommendations are included in many guidelines for the management of cardiovascular disease, while gender-based disparities in performance on widely used quality indicators for the management of ischemic heart disease and its risk factors have been well documented (Mosca et al. 2011). However, much less attention has been paid to addressing identified sex and gender disparities in ICU care.

### Gender-Based Disparities in Care

Gender disparities in ICU admission have been observed in both Europe and North America. Studies from Canada, Finland and Austria found that after controlling for illness severity, women were less likely to be admitted to an ICU than men (Fowler et al. 2007; Reinikainen et al. 2005; Valentin et al. 2003). Women have also been found to have a higher severity of illness on admission and shorter lengths of stay in the ICU than men (Valentin et al. 2003; Reinikainen et al. 2005; Vezzani et al. 2011). Older women appear to be at the highest risk for being denied ICU care. After controlling for potential confounders, Fowler and colleagues found that women over 50 years of age were not only less likely than men in the same age category to be admitted to an ICU, but also had higher rates of mortality (Fowler et al. 2007).

Women and men also differ in ICU admission diagnoses. It has been found that most often women are admitted with a medical diagnosis and

men following elective surgery (Fowler et al. 2007). Furthermore, following acute traumatic injury, women have been found to develop higher rates of acute respiratory distress syndrome (ARDS) than men (Heffernan et al. 2011).

Once admitted to the ICU, there is evidence that female patients receive fewer interventions compared with male patients. Several large studies have found that female patients received fewer invasive procedures, including mechanical ventilation, pulmonary artery catheterisation, vasoactive medication use, and central venous catheter insertion than male patients, despite having the same or higher severity of illness (Fowler et al. 2007; Raine et al. 2002; Valentin et al. 2003).

## Sex-Based Differences in Critical Illness

Sex-based differences in ICU outcomes, including mortality, have been found in multiple studies. However, findings have varied across studies, dependent on the condition and age of patients, with some studies finding a disadvantage for men, some for women, and some finding no sex-based differences. (Fowler et al. 2007; Frink et al. 2007; Reinikainen et al. 2005; Sperry et al. 2008). A French study found that among patients who develop hospital-acquired infections in the ICU, female gender is associated with higher mortality (Combes et al. 2009). Male sex was found to be an independent risk factor for VAP (Zahar et al. 2009). Table 1 offers a summary of sex- and gender-based differences in intensive care.

## Factors Contributing to Sex and Gender-Based Differences in Critical Care

Multiple factors may contribute to sex and gender-based differences in critical care (Bierman 2007):

1. Biology likely plays a role, as genetic factors and sex hormones may contribute to these differences. Recent studies have concluded that sex hormones influence response to stress and injury (Berry et al. 2009; Heffernan et al. 2011; Mohr et al. 2010);
2. Disease prevalence differs by sex, which influences admission diagnoses;
3. Women tend to have higher levels of comorbidity and disability, which can influence both clinical decision making and health outcomes;
4. There appears to be an interaction between sex and age, with studies showing older women to be at particular risk for less aggressive care and suboptimal outcomes;
5. Differences in decision making by physicians, patients and their caregivers may also contribute;
6. Gender bias, which has been shown to contribute to gender-based differences in cardiovascular care and orthopedic surgery, may also play a role. This bias may sometimes also lead to overuse of invasive procedures in men; and
7. The under-representation of women in clinical trials in the field of critical care has resulted in lacking evidence as to when gender-specific approaches may be needed.

## Eliminating Gender- Based Disparities in Intensive Care

There is a lot that can be done to address sex- and gender-based differences in ICU care. Quality improvement initiatives can play an important role in fostering gender equity in critical care. Standardised guidelines and care bundles are widely used tools to support improved performance on quality indicators, including rates of VAP, central line infections, and venous thrombo-embolic events (McMillan et al. 2007). Use of guidelines to increase adherence to evidence- based practice recommendations can help ensure that both women and men receive indicated care. However, we will not know whether quality improvement activities reduce or eliminate gender- based disparities in ICU care unless quality indicators are sex stratified. Doing so, will provide a better understanding of gender differences in critical care as well as the impact of specific interventions on disparities.

## Conclusion

Equity is an important dimension of healthcare quality (Bierman et al. 2012; Bierman and Clark 2007). In the future, advances in our understanding of sex differences relevant to critical care through both animal studies and increased representation of women in clinical trials may lead to sex-specific recommendations and guidelines. Presently, increased awareness of gender differences, routine sex stratification of quality indicators, and gender-sensitive approaches to clinical decision making can all help increase gender equity in the ICU.

The growing focus on ICU quality provides a great opportunity to reduce and in due course eliminate gender disparities in care. Ultimately, the goal is to optimise access, quality and outcomes of care for both woman and men in the ICU, delivering the right care, in the right setting, at the right time, to all patients.

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