Rates and Causes of Mortality Associated with Spine Surgery Based on 108,419 Procedures: A Review of the Scoliosis Research Society Morbidity and Mortality Database

Manish K. Kasliwal MD MCh; Justin S. Smith MD PhD; Dwight Saulle MD; Christopher P. Ames MD; Lawrence Lenke MD; Steven D. Glassman MD; David W. Polly MD; Christopher I. Shaffrey MD, FACS

University of Virginia,Charlottesville,VA (MKK, JSS, DS & CIS);Washington University,St Louis, MO(LL); University of Minnesota, Minneapolis, MN(DWP); UCSF, San Francisco, CA(CPS); Twin Cities Spine Center, Minneapolis, MN(JP)

Introduction

- **Despite the best of care, all surgical procedures have inherent risks of complications, including mortality**
- **Defining these risks is important for patient counseling and quality improvement**
- **The objectives of this study were to assess rates and causes of mortality associated with spine surgery based on a large prospectively collected, multicenter database**

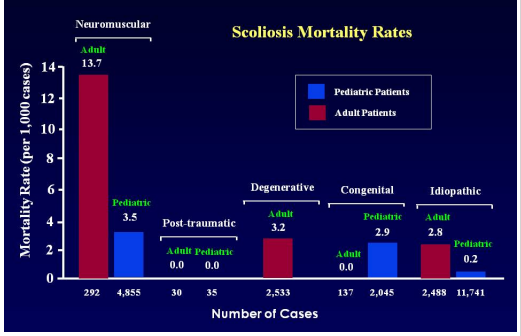
Methods

- SRS M&M database queried (2004-2007) for all reported cases
- All deaths occurring within 60 days and complications within 60 days of surgery that resulted in death were assessed.
- Rates of mortality stratified based on:
  - diagnosis
  - age (pediatric <21 *vs* adult ≥21)
  - whether implants used
  - primary *vs* revision surgery

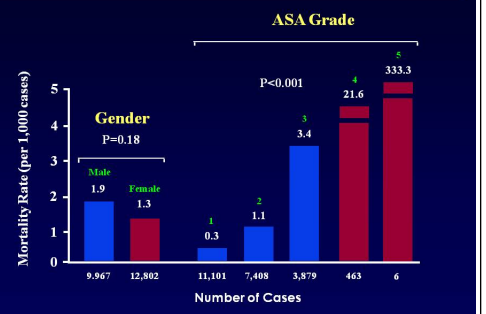
Results

- 197 mortalities among 108,419 cases (1.82 deaths per 1,000 cases)
  - Adult: 1.99 / 1,000 cases
  - Pediatric: 1.26 / 1,000 cases
- Timing of death:
  - Prior to discharge 79% (109/138)
  - 94 had specification of specific POD:
    - POD #0 -> 23
    - POD #1-3 -> 17
    - POD #4-14 -> 30
    - POD # >14 -> 24

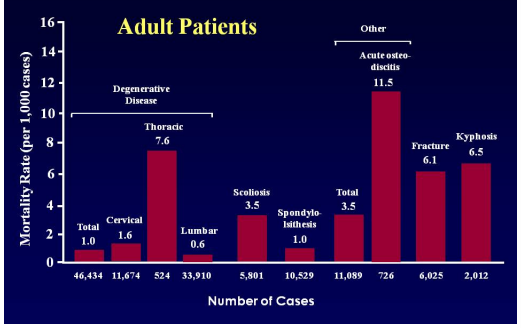
Mortality Rate Based on Subtype of Scoliosis



Mortality Rates Based on Patient Parameters (2007 Only)



Mortality Rate Based on Primary Diagnosis



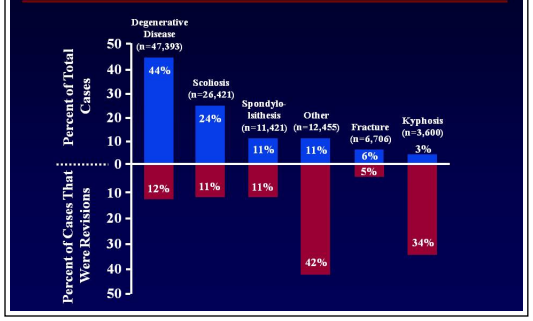
Causes of Mortality

Reported Cause of Mortality	Total (107,996)	Primary Diagnosis (No. cases)* Degenerative (47,393)	Scoliosis (26,421)	Spondylo-listhesis (11,421)	Fracture (6,706)	Kyphosis (3,600)	Other (12,455)
Respiratory/pulmonary	**83**	**17**	**18**	**3**	**19**	**8**	**18**
Respiratory failure	(23)	1	6		7	1	8
PE	(11)	5		1	2	2	1
Presumed PE	(9)	3	2		1	2	1
Pneumonia	(9)	1	2		2	2	2
Aspiration	(9)	2	2	1	1	1	2
ARDS	(3)		2		1		
Other	(3)	3					
Not specified	(16)	2	4	1	5		4
Cardiac	**41**	**12**	**8**	**6**	**7**	**2**	**6**
Myocardial infarction	(16)	8		2	3	1	2
Cardiac arrest	(13)	3	3	1	4		2
Cardiac arrhythmia	(4)		1	1		1	1
Not specified	(8)	1	4	2			1
Sepsis	**35**	**8**	**7**		**6**	**3**	**11**
Stroke	**15**	**5**	**3**	**1**	**2**		**4**
Operative blood loss	**8**	**1**	**5**			**1**	**1**
MSOF	**3**				**2**	**1**	
Other	**6**		**4**		**1**		**1**
Not indicated/unknown	**6**	**1**	**3**		**1**	**1**	
Total	**197**	**44**	**48**	**10**	**38**	**16**	**41**
Deaths/1,000 cases	**1.8**	**0.9**	**1.8**	**0.9**	**5.7**	**4.4**	**3.3**

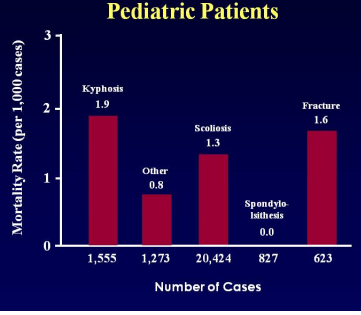
Conclusions

- **Mortality rates for pediatric and adult patients were 1.99 and 1.26 / 1,000 cases, respectively.**
- **Most common causes of mortality: respiratory/ pulmonary, cardiac, sepsis, stroke, and intra-op blood loss**
- **Increased mortality rates with higher ASA, greater age, use of implants, spinal fusion, revision cases**
- **Benchmark mortality rates for on-going efforts to improve patient care**

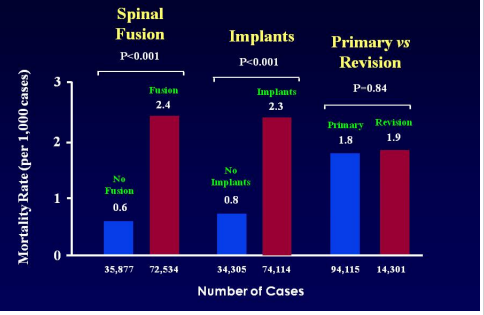
Distribution of Cases Reported from 2004-2007 Based on Primary Diagnosis



Mortality Rate Based on Primary Diagnosis



Mortality Rates Based on Surgical Parameters



Learning Objectives

- **Appreciate general rates of mortality associated with spine surgery based on a broad range of diagnoses.**
- **Appreciate differences in rates of mortality among adult and pediatric patients treated surgically for spine disease.**
- **Appreciate common causes of mortality associated with spine surgery.**