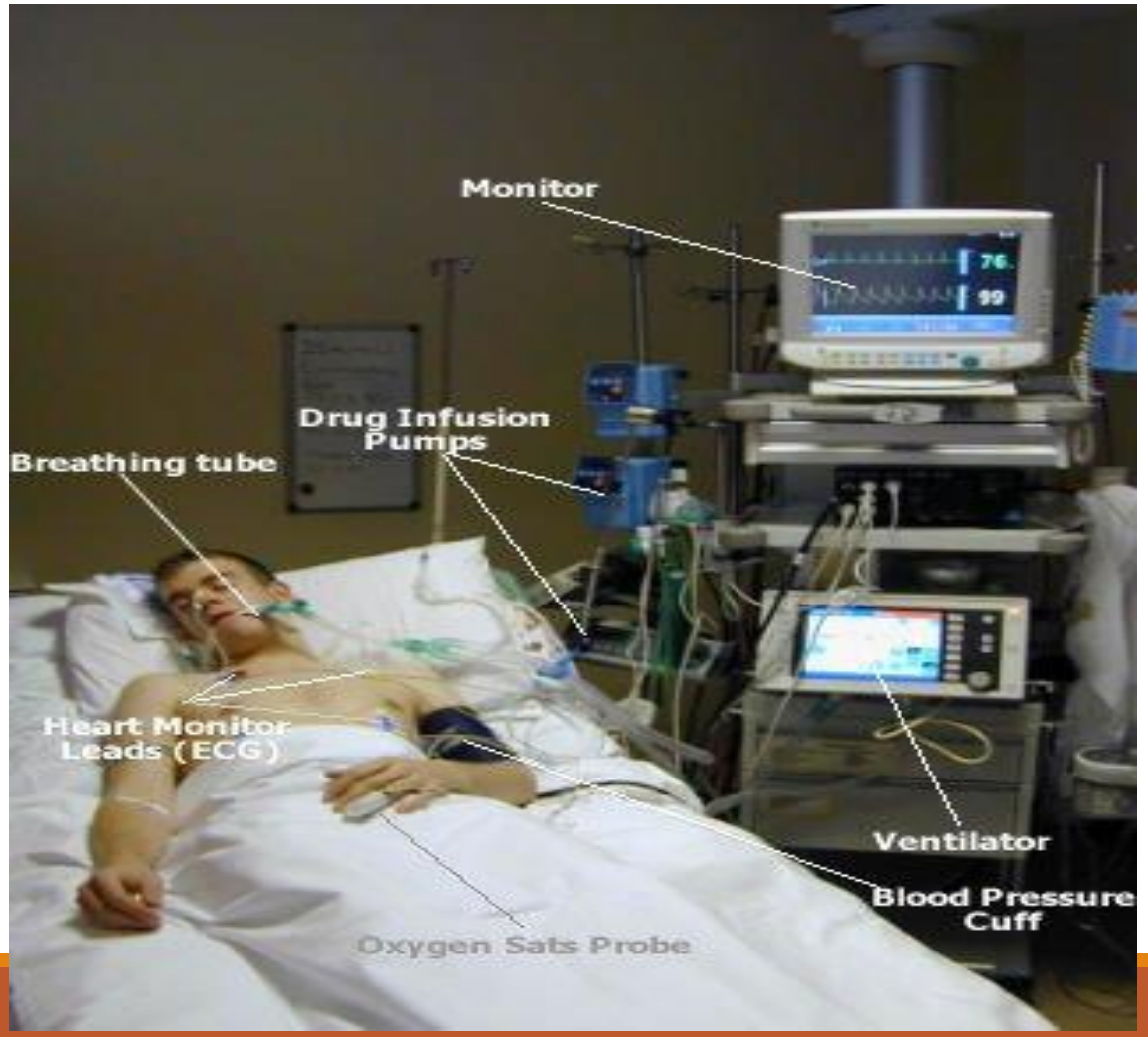
A Primer on Medical Quality 2018

ALAN F. ROTHFELD, MD
2 OF 2, CONTINUED

The Fetal Position

The Fatal Position



Nosocomial Pneumonia

"We are not designed to be able to breathe in the supine position and no vertebrate ever assumes this position for long. Unless, of course, you include ICU patients – and they don't do it willingly"

MHV Strickland, MD 1995

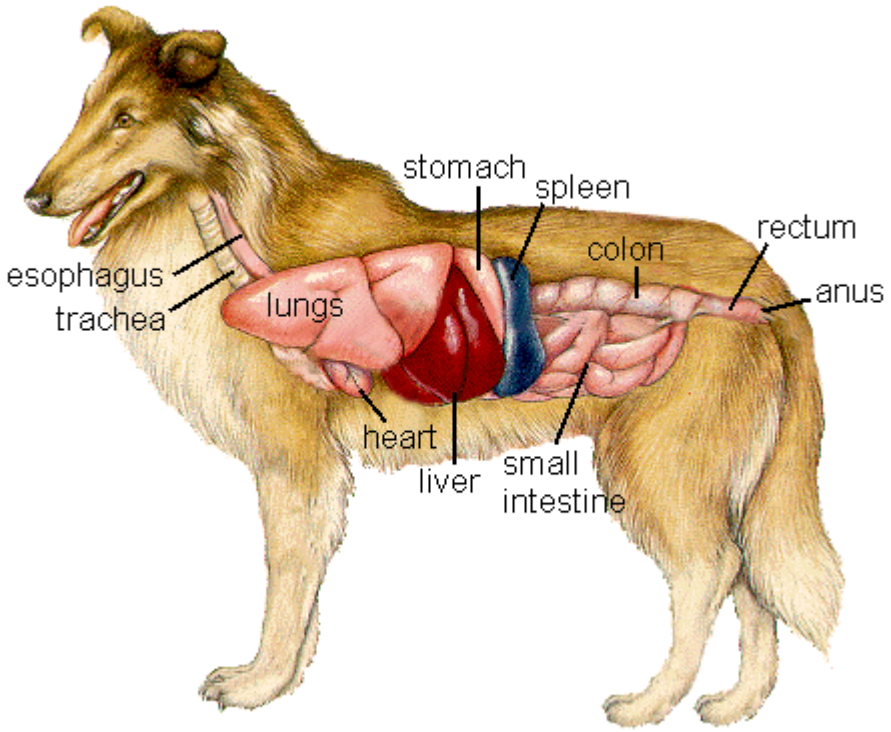
Design specifications of the vertebrate lung

Battle between thin and thick alveolar membranes

- Thick for strength and resilience to injury and O2
- Thin for efficient gas exchange
- Thin won

Design specification

- physiology tuned for the prone position
  - ★mechanical ventilation: supine
- operating pressures -5 to -1 (negative)
  - ★ mechanical ventilation: 0 to +20 or more
- FiO2 never more than .21
  - ★ mechanical ventilation: FiO2 usually > .21



Results of Immobility

- **Pulmonary emboli**
- **Atelectasis**
- **Pneumonia**
- **Sepsis (the leading cause of ICU death)**
- **Ventilator dependence**
  - Mechanical disadvantage
  - Increased dead space
  - muscle atrophy/deconditioning
- **Negative nitrogen balance**
  - Poor wound healing
  - Decubitus ulcers
- **Dementia and Psychosis**

Observations in Patients in Bed for >5 days

1. Small lung volumes/ “microatelectasis” 95%
2. Atelectasis 82%
3. Pneumonia ~20%
4. Infarction from emboli 7%
5. Edema: heart failure 5%
6. Edema: vascular leak 4%
7. Bleeding 4%

Wunderink, Chest 1992;101:458 (autopsy)
Fagon, Chest 1993;103:547 (strict criteria)

Indirect Harm from Ventilation -4

Delayed Weaning

Avoidable (Indirect) Harm from Ventilation - 4

Harm from delayed weaning

Daily increases in

- Medication errors
- Emboli
- Nosocomial infections
- MI
- Low cardiac output complications
  - Dementia
  - Renal failure
  - Cardiac events

The sedation-dementia cycle

- Failure to use dementia checklist
  - Dementia
    - Often inappropriately treated with sedation instead of antianxiety measures
  - Sedation
    - May contribute to dementia

Where does the RCP fit in the ICU team?

How to have a rewarding career

1. Volunteer to help with everything

(within your scope of practice)

- Physical help
- Airway care
  - Its YOUR job; others can help you
- The more you do, the more satisfying it becomes and the more you are valued

How to have a rewarding career -2
2. Talk to everyone all the time

MDs – many RCPs say that interacting with MDs is the best part of their job
- Why would you forego that?
- You have all the information and the MD makes all the decisions. Disconnects are often fatal

RNs – usually feel overworked and stressed
- They are usually very grateful for any help and will include you as a valued member of the team

Patients – very rewarding when possible
- cuts down on sedation requirements

Families – often left out of communication
- They have insight and a lot to offer the patient
- Often anxious and suspicious

How to have a rewarding career

3. Be the Wizard of the Checklist

A Master ICU Checklist

- ❑ Ventilator Checklist
  - RCP
- ❑Is the patient stable for spontaneous breathing test? (P, BP, a/A, BE, f 6-30)
  - RCP
- ❑Foley, central line necessity/maintenance checklists
  - infection prevention practitioner
- ❑Sedation checklist
  - Primary RN with Pharmacist sign-off
- ❑Mobilization checklist
  - PT
- ❑Medication checklist (bar codes, medication review)
  - pharmacist and Antibiotic Stewardship team
- ❑ Placement (LTAC/SAU/palliative care evaluation) checklist?
  - Utilization RN

Sample Event Checklist Set

HYPOTENSION OR TACHYCARDIA

INCREASE IN AIRWAY PRESSURE

DECREASE IN AIRWAY PRESSURE

DECREASE IN O2 SATURATION

PATIENT NOT BEING WEANED

PATIENT FAILING WEANING

A Sample Event Ventilator Checklist

BP<90 SYST OR HEART RATE >110

1. Notify in-house MD

2. If patient has diagnosis of COPD or is over 65 years old
   - ❑ Mode to IMV
   - ❑ Adjust I/E ratio to 1:3 or more
   - ❑ ↑flow rate. Discuss order for ↓f, ↓ Vt,
   - ❑ Measure PEEPi
     - ❑ If present readjust to get longer E time per above

3. If BP still <100 syst or P>110
   - ❑ Obtain IV fluid order
   - ❑ Sepsis bundle
   - ❑ EKG, cardiac enzymes

4. Consider pulmonary embolus

5. Consider Pressors

What is the major difference between airlines and hospitals?

CULTURE

DITCHING

PREPARATION

- CABIN CREW ..... NOTIFY
- ATC/TRANSPONDER ..... NOTIFY/AS RQRD
- GPWS SYS ..... OFF
- SEAT BELTS/NO SMOKING ..... ON
- CABIN and COCKPIT ..... PREPARE

. *Loose equipment secured.*
. *Survival equipment prepared.*
. *Belts and shoulder harness locked.*

- LDG ELEV ..... SELECT 00
- V BUGS ..... SET
- BARO ..... SET

Omit the normal approach and landing checklist.

APPROACH

- L/G LEVER ..... UP

● **If engines running :**
- SLATS and FLAPS ..... MAX AVAIL

● **If engines not running :**
- FOR LDG ..... USE FLAP 3
- USE RUDDER WITH CARE
- MIN RAT SPEED ..... 140 KT

- ENG MODE SEL ..... NORM
- CABIN REPORT ..... OBTAIN

BEFORE DITCHING

- CAB PRESS MODE SEL ..... CHECK AUTO
R - BLEED (ENGs and APU) ..... OFF
- DITCHING pushbutton ..... ON
- BRACE FOR IMPACT ..... ORDER

Touch down with approximately 11° pitch attitude, and minimum aircraft V/S.

JUST BEFORE DITCHING

- ENG MASTERS ..... OFF

AFTER DITCHING

- ATC (VHF 1) ..... NOTIFY
- FIRE pushbutton (ENGs and APU) ..... PUSH
- AGENTS (ENGs and APU) ..... DISCH
- EVACUATION ..... INITIATE

Enough

Shorter heads down

Overdone?

8.9 million hospital admissions annually have no medical justification

- Siu AL, New Engl J Med 315:1259-66
- Eriksen BO, J Intern Med 246:379-87

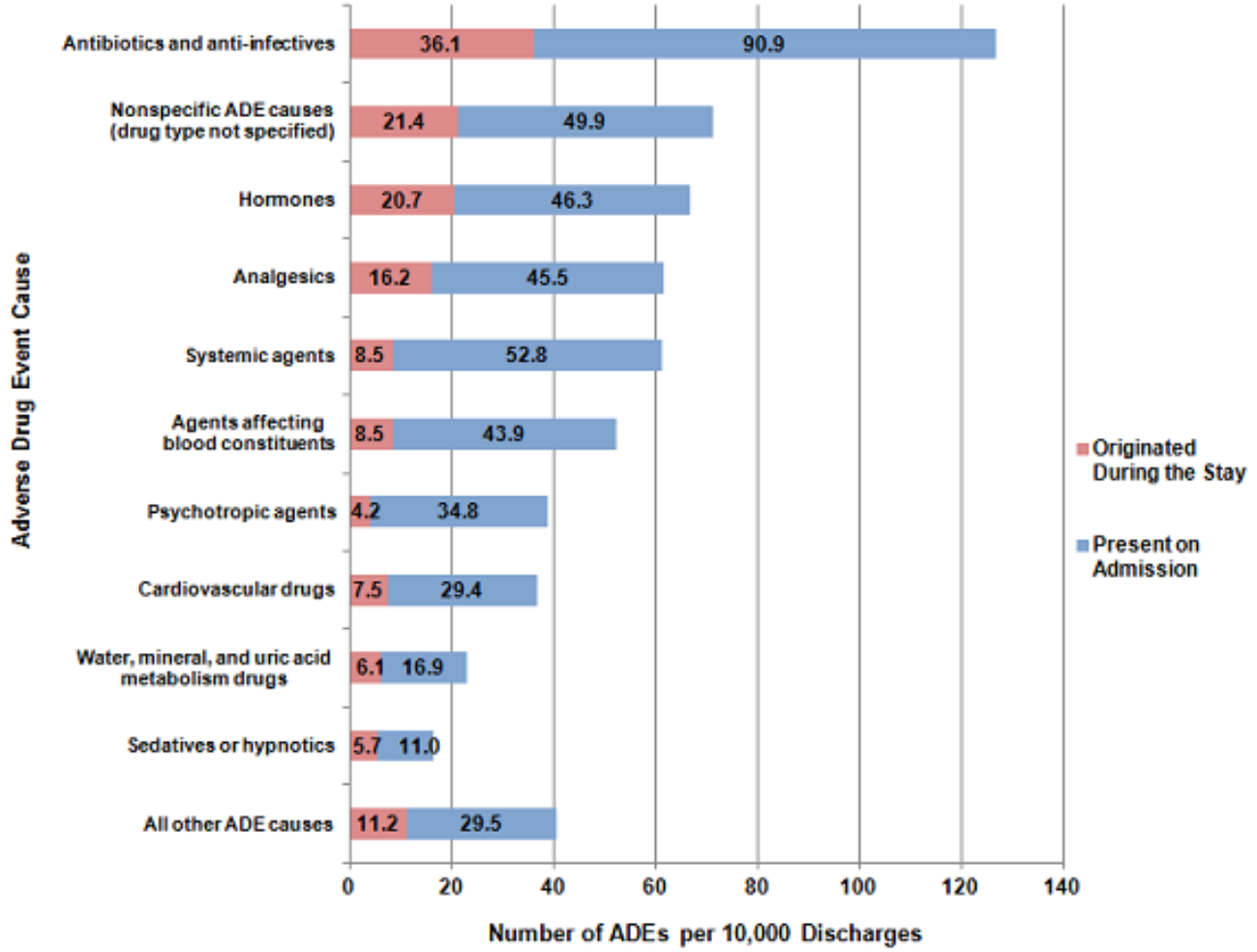
36% of hospitalizations could have been handled as outpatients

- -CMS in Fed Reg 5/10/2013

Drug Usage

- The average hospitalized patient receives a median of 9 drugs
- ICU patients receive a median of 11 drugs
- Aspirin/acetaminophen
- Sedatives
- Laxatives
- Antibiotics

ADRs in U S Hospitals



Serious Adverse Drug Reactions

Lazarou, *279:1200-5*

Serious ADRs:6.7%

fatal ADRs: 0.32%

⇒2,216,000 patients had serious ADRs

⇒ 106,000 had fatal ADRs

ADRs (excluding errors) are between the fourth and sixth leading cause of death in the U.S.

	number	%	Per10^5
All causes	2,416,425	100	848.5
1. Diseases of heart	700,142	29.0	245.8
2. Malignant neoplasms	553,768	22.9	194.4
3. Cerebrovascular disease	163,538	6.8	57.4
4. Chronic resp. diseases	123,013	5.1	43.2
5. Accidents (unintentional)	101,537	4.2	35.7
6. Diabetes mellitus	71,372	3.0	25.1
7. Influenza and pneumonia	62,034	2.6	21.8
8. Alzheimer's disease	53,852	2.2	18.9
9. Kidney Failure	39,480	1.6	13.9
10. Septicemia	32,238	1.3	11.3

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Errors

Medical Errors

Overwhelmingly in Hospitals

Adverse events occur in 17% of admissions

- **13.7% permanent disability**
- **4.9% mortality**

69% of all injuries in hospitals are caused by errors

- **Most errors are related to "complexity of treatment plans" and not negligence**
- **More than 50% are "easily preventable"**
  - **QRB Qual Rev Bull. 1993;19:144**
  - **Med J Aust 2001;174:369**
  - **Surgery. 1999;126:66**

Temporal trends in harm resulting from medical care.

New Engl J Med Landrigan C, 2010;363:2124-34

25% of patients hospitalized from 2002-2007 suffered major "Harms"

- **procedures**
- **drugs**
- **hospital-based infections**
- **tests**
- **falls**

63% were deemed preventable

5. Avoidable Surgical Errors

Failure to enforce checklist use

Failure to develop a collaborative operating room culture

Failure of effective peer review

Failure to provide meaningful feedback

Failure to have the patient mark site of surgery

6. Lab Errors

Failure to employ EHR for all lab reporting

Failure to employ bar coding

Failure to establish guidelines for appropriate laboratory orders

Failure to peer review laboratory use

- 20% of providers order 50% of all lab work

7. Avoidable Blood Transfusions

Avoidable failures

- 1. Failure to abide by evidence based transfusion thresholds
  - More than half of all transfusions are unneeded and are harmful
- 2. Failure to follow checklists
- 3. Failure to use bar coding
- 3. Failure of institutional culture
  - Failure to peer review all transfusions
  - Ineffective/corrupt peer rreview
  - Granting of immunity to certain providers
  - Failure to obtain clinical pathologist approval pre-transfusion

Solutions

Checklists

Control tidal volumes
- 420 currently favored but evidence exists for as low as 200
- May help reduce the effects of high pressures on lung tissue

Watch out for hyperinflation in older patients and others with COPD
- Auto PEEP measurements
- E times at least 3x I times
- Permissive hypercapnia may be better than continuous codes

Limit lung injury in patients with inflammatory lung disease like ARDS and pneumonia
- Limit Vt
- Limit FiO2
- Probably limit PIP(?)
- Permissive hypercapnia may be better than recurrent “pneumonias” and the resultant antibiotics

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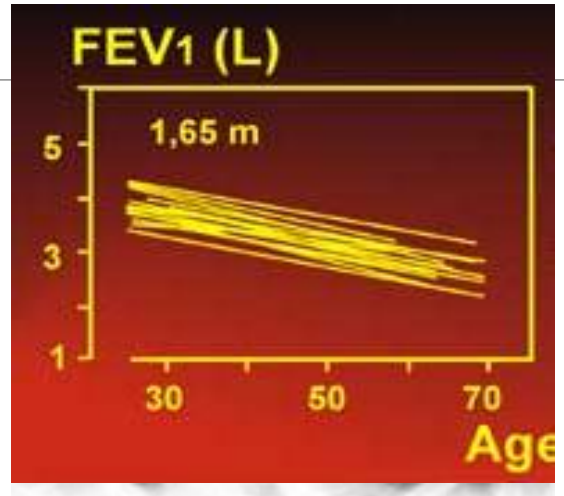
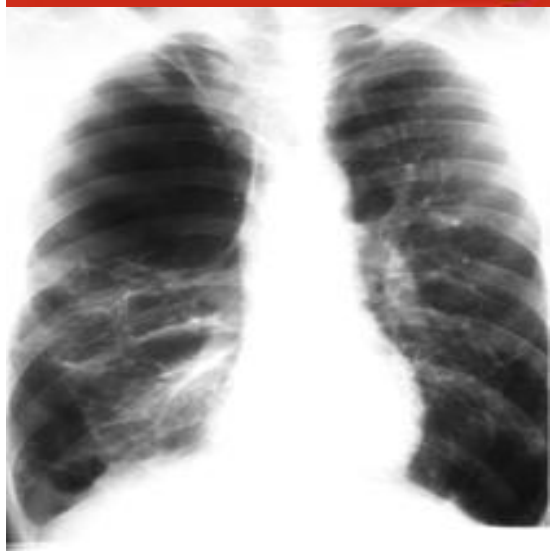
Some Causes of CXR Infiltrates in Patients on Mechanical Ventilation

In order of frequency

1. Being old
2. Edema: heart failure
3. Edema: vascular leak
4. Bleeding
5. Atelectasis
6. Fibrosis
7. Chronic scarring
8. Pneumonia
9. Vasculitis





Wunderink, Chest 101:458 (autopsy)
Dotson, Chest 103:541 (intracellular bacteria)

How do ventilators contribute to mortality?

1. Delayed weaning
   - Bedrest/sedation/immobility/supine position
     - Emboli
     - Hypostatic pneumonias/atelectasis
     - Muscle atrophy
   - Bacterial and viral pneumonia
   - dementia
   - Sedation

2. Lung injury
   - High positive pressures vs slightly negative pressures

3. continuous cardiac stress test
   - Increase in Mis
     - CHF with weaning
   - Low cardiac output
     - Renal insufficiency
     - Dementia
     - Organ failures
     - Complicates sepsis

3. Regardless of obstruction or restriction

1. Bedrest with failure to mobilize
2. nosocomial issues
3. Failure to wean promptly
   - Use of weaning parameters delays weaning
   - The only validated predictor is spontaneous breathing trials
     - Screen for stability first
       - Hemodynamics, oxygenation, metabolic acidosis, f 6-30

Avoidable harm from ventilators -1

Failure to identify patients with obstructive lung disease (including everyone over 65)

- “black” CXR, history

High risk for hyperinflation

- Cardiac stress
- Hypotension
- Baro-/volutrauma
- Pulmonary emboli

Avoidable direct harm from ventilators

1. **Atelectasis/pneumonia**
2. **Barotrauma/volutrauma**
3. **Cardiac problems**
4. **“Diuretic” effect**
   - **Hypotension/tachycardia**
5. **Emboli**
6. **Fibrosis**

Therapists should learn the alphabet

How to have a rewarding Career -3
Be The Wizard of the Checklist

These 4 emergencies require their own checklists

1. Not being mobilized checklist (RN and PT)

   Head of bed elevated

   sitting up in chair

   walking

2. Foley or central line present checklist (RN and MD)

   are all devices (catheters) needed TODAY? Why?

3. Not being Weaned or placed at another level of care checklist

   is there a reason not to try a spontaneous breathing trial?

   (BP, p, a/A, metabolic acidosis, f 6-30)

   would the patient do better at an LTAC or SAU?

   where preventative care is a higher priority

4. Sedation checklist (RN and pharmacist)