Module 2. Integrative Model: Patient Safety and Clinician Wellbeing Series

Michael R Privitera MD MS
Professor of Psychiatry
Director, Medical Faculty and Clinician Wellness Program
University of Rochester Medical Center
Chair, MSSNY Task Force on Physician Stress and Burnout.
Biopsychosocial Model

Hierarchy of Natural Systems

1. Biosphere
2. Society-Nation
3. Culture-Subculture
4. Community
5. Family
6. Two-Person
7. Person
   (experience & behavior)

Continuum of Natural Systems

1. Biosphere
2. Society-Nation
3. Culture-Subculture
4. Community
5. Family
6. Two-Person
7. Person
8. Nervous System
9. Organs/Organs Systems
10. Tissues
11. Cells
12. Organelles
13. Molecules
14. Atoms
15. Subatomic Particles

Am J Psychiatry May 1980

George Engel MD
1913-1999
Six categories of Work Stress that can contribute to Burnout

1. **Excessive workload** - physical, cognitive and emotional
2. **Lack of control** - being able to influence work environment
3. **Poor balance between effort and reward** - material and intangible rewards.
4. **Lack of community** - culture of mutual appreciation and teamwork
5. **Lack of fairness** - resources and justice
6. **Value conflict** - moral distress of having to participate in suboptimal, unethical circumstances.


---

### Top 10 Work Related Stressors in NYS Physicians

<table>
<thead>
<tr>
<th>Rank Order</th>
<th>Description</th>
<th>% Responses</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Length and degree of Documentation Requirements</td>
<td>65.99%</td>
</tr>
<tr>
<td>2</td>
<td>Extension of Workplace into Home Life (E-mail, completion of records, phone calls)</td>
<td>58.27%</td>
</tr>
<tr>
<td>3</td>
<td>Prior Authorizations for: Medications/Procedures/Admissions</td>
<td>54.74%</td>
</tr>
<tr>
<td>4</td>
<td>Dealing with difficult patients</td>
<td>51.89%</td>
</tr>
<tr>
<td>5</td>
<td>EMR functionality problems</td>
<td>51.05%</td>
</tr>
<tr>
<td>6</td>
<td>CMS/State/Federal laws and regulations</td>
<td>44.33%</td>
</tr>
<tr>
<td>7</td>
<td>Lack of voice in being able to decide what good care is</td>
<td>40.39%</td>
</tr>
<tr>
<td>8</td>
<td>Hospital/ Insurance company imposed Quality Metrics</td>
<td>38.87%</td>
</tr>
<tr>
<td>9</td>
<td>Dealing with difficult colleagues</td>
<td>31.49%</td>
</tr>
<tr>
<td>10</td>
<td>Requirement for increased CME/Maintenance of Certification</td>
<td>31.49%</td>
</tr>
</tbody>
</table>

MSSNY Survey Fall 2016

80% are organizational/systemic
Cognitive Load Theory

We need to reduce Extraneous Load

- Mental overload
- Poor decision quality
- Goal shielding - looses larger context issues
- Low neural resource → Cognitive Flexible Memory reverts to Habit/ Automatic Memory: ↑ errors

Mental Reserve Remaining
Have access to Cognitive Flexible memory

Extraneous Load - burden in cognitive processing information that can be improved by better design. e.g. poor EHR design

Germaine Load, Planning and doing next steps manage the care, emotional work with patients and families

Intrinsic Load: inherent level of difficulty. E.g. Diagnosis and treatment of CHF, HTN, CVA, Depression etc etc thought to be immutable load

Medical Decision Making (MDM) Normal

Intrinsic Load
Medical Decision Making Impaired !!**

Yerkes-Dodson Law
(Performance effect when demand goes up)

1. e.g. repetitive task, automatic
2. e.g. requiring effortful thinking.

Diamond DM, Campbell AM, Park CR, Halonen J, Zoladz PR
Neural Plasticity Article ID 60803, 1-33, 2007.
Key Relevant Structures of the Clinician’s Brain
Neural Resources (why patients see us)

- Neural Resources = brain power = synaptical currency = brain capital
- Brain comprised of living cells, require glucose and oxygen.
- Need to be recharged with use.

Executive Function of Brain
(Controlled through Pre-Frontal Cortex)
Controls the ability to:
- Focus
- Keep attention
- Self-control of behavior and speech
- Planning
- Organizing
- Perspective taking
- Cognitive flexibility
  - *(to consider a good differential diagnosis)*
- Medical and other decision making
- Ability to defer gratification
- Estimating time
- Working memory

Other neural resources
(interact with executive function)
From other brain structures
- Memory
- Knowledge base
- Creativity
- Problem solving
- Experience
- Applied wisdom
- Depth perception
- Motor control, fine and gross.
Executive Function Neural Resource—Used Up in These Processes:

• Focusing of attention
• Decision making (no matter the size of decision)
• Sorting, classifying
• Multitasking, getting back on track after interruption.
• Re-routing or switching from one mental task to another.
• Maintenance of goals
• Maintenance of information active in working memory
• Updating working memory
• Self-regulation: professionalism, self-effacement despite how treated,
  Maintaining “Aequinimitas” in setting of bleeding, injury, pain, etc.
• Emotion work: dealing with bad outcomes, distressed patients and families
Clinicians think they are pushing to “HUMP” as if Eustress. They don’t realize they are actually pushing into Distress (“overdraft”).

Multiple work stresses from uncoordinated sources:
Each small alone but incrementally accumulate.

$1 + 2 + 3 + 4 + 5 + 6 \ldots \ldots \ldots \ldots$

Point A = even minimal arousal can precipitate breakdown

Well Intended: e.g. Patient safety metrics, mandates, regulations
Not so well intended: e.g. wear down techniques of clinician to control costs

Figure 1. Adapted from: Nixon PGF. The Practitioner. (217):765-770. 1976

Point A in need!!
‘Therapeutic Window’ for Optimal Quality and Safety

Translational Model Based on Literature

Human Factor/ Ergonomic Effects

Increasing Quality & Safety effects

Numeric increase of quality metrics, mandates, regulations, laws, “guardrails”, policies, requirements, certifications.

Model built from:

Nurses

NY STATE NEWS  February 6, 2016

New York Nurses Urge State Staffing Law.

NYS nurses calling on state legislature to set **minimum staffing levels** for hospitals and nursing homes to “improve patient outcomes by addressing a chronic staffing problem”

Pharmacists

Campbell J. **North Carolina** Supreme Court holds that board of pharmacy may regulate pharmacist working conditions. *Rx Ipsa Loquitur.* 2006;33:1,10-11.

- **Recommend no more than 10-20 prescriptions filled per hour/150 in a shift.**
- Sends a message to ownership that it has a responsibility for reasonable employee scheduling and can share in the consequence of high-volume dispensing which produces errors.
Sources of Emotional influence on Clinical Performance

• Ambient-induced
  1. *Transitory affective state:* mood states which are not caused by a single stimulus but an accumulation of experiences.
  2. *Environmental*—heat, cold, noise
  3. *Stress,* time pressure, fatigue, under threat (happens also if overwhelmed)
  4. *Other*—unapproachable, rude or demeaning colleague

• Clinical situation-induced
  1. *Counter transference:* feelings induced in you that color your perceptions of someone
  2. *Fundamental Attribution error:* Overemphasize personal characteristics and ignore situational factors in judging others' behavior.

• Endogenous
  1. *Circadian,* number of hours awake, seasonal mood variation
  2. *Mood and Anxiety Disorders*

Effect of Rudeness in Healthcare Delivery

Have you ever been on the receiving end of rudeness from a colleague, patient or family of patient? How did it effect your thinking at the time?

The Impact of Rudeness on Medical Team Performance: A Randomized Trial

PEDIATRICS Volume 136, number 3, September 2015
1. Cognitive overload, emotion work, other forms of “shadow work”*
2. Frustration from over expectations
3. Continued demands but not enough internal and external resources
4. Chronic elevated Allostatic load #.

**Limbic System**
- **Hippocampus** - determine danger vs. reward
- **Amygdala** - increased arousal proportional to strength of Emotional response.

**Pre Frontal Cortex**
- arousal diminished

Label **with words (in your mind) what you are feeling** to lower limbic system arousal.

* **Shadow work** -- Unseen, unmeasured, unpaid jobs that fill your day.

# **Allostatic load** — wear and tear physiologically from chronic or repeated exposure to stress.
Struggle Between the Emotional Brain and the Wise Brain

Examples:

- Difficult patient, violence staff bullying, disruptive behavior. EMR frustration
- Self effacement, professional self control. Over time leading to resource depletion that decreases PFC control.

**Coping** with multiple factors that thwart good care. Emotion work with death, illness, families grieving. Work arounds from poor functionality. Poor EMR interface design. Organizational problems requiring extra work as result.

**Chronic occupational stress & Burnout, Depression**

**Threats to self regulation and to optimum executive function**

- **Cue Exposure**
- Lapse activated over response

**Increased Amygdala activity**

**Impulses Overwhelm Prefrontal Control**

**Neural Resource Depletion**

- Alcohol consumption
- Sleep deprivation
- Brain injury
- Anatomical change in PFC

**Less inhibition of Amygdala activity**

**PFC Function is Impaired**

**Decreased Prefrontal Cortex activity**

Biologic Changes of Burned Out Individual

1. **Hormonal**: Chronic cortisol changes lead to plaques on coronary arteries.

2. **Neurotransmitter**: Excess glutamate decreases grey matter of Basal ganglia which decreases fine motor control

3. **Anatomical changes**:
   - Thinning of Pre-frontal cortex affects ability to focus, attention, quality of medical decision-making
   - Enlargement of Amygdala creates increased reactivity to stress
   - Hippocampus shrinking reduces short term memory, then long term memory

→ Creates head MRI findings similar to early life trauma individuals


Odds Ratio for Major Depression, by Degree of Burnout Symptoms [1]

<table>
<thead>
<tr>
<th>Burnout* Level</th>
<th>None</th>
<th>Mild</th>
<th>Moderate</th>
<th>Severe</th>
</tr>
</thead>
<tbody>
<tr>
<td>Odds ratio for having Major Depression#</td>
<td>2.99 (95% CI: 2.21-4.06)</td>
<td>10.14 (95% CI: 7.58-13.59)</td>
<td>46.84 (95% CI: 35.25-62.24)</td>
<td>92.78 (95% CI: 62.96-136.74)</td>
</tr>
</tbody>
</table>

CI = confidence interval

- **Burnout** is a work related condition in the context of a work setting. Intimates job strain and high occupational stress. This term helps focus solutions that need to be organizational and individual.

- Occupational stress: "the harmful physical and emotional responses that occur when the requirements of the job do not match the capabilities, resources or needs of the worker. Job stress can lead to poor health and even injury."[2]

- **Major Depression** is a clinical condition, is considered Personal Health Information (PHI) that is confidential.

Several Neurotransmitters Are Involved in Coping: With Deficits showing in Behavior and Mood

Role of Norepinephrine in the CNS

- Norepinephrine modulates
  - Mood
  - Learning and memory
  - Arousal
  - Regulation of sleep-wake cycle
  - Regulation of hypothalamic-pituitary axis
  - Regulation of sympathetic nervous system

Role of Dopamine in the CNS

- Dopamine modulates various brain functions
  - Mood
  - Cognition
  - Motor function
  - Motivation
  - Drive
  - Aggression
  - Pleasure

Role of Serotonin in the CNS

- Serotonin modulates various brain functions
  - Mood
  - Sleep
  - Cognition
  - Anxiety
  - Sensory perception
  - Temperature regulation
  - Nociception (e.g., migraine headache)
  - Irritability
  - Appetite
  - Sexual behavior


Depressive and Aggressive Reactions to Stress in Burnout (Dose-Related)

Burnout, Depression, Disruptive Behavior (MD population example).

39.8% of MDs have Depression

54% of MDs have High Burnout

2-4% of MDs are Disruptive

# Decision Fatigue

Consequences of Using Up Neural Resources (Despite adequate fund of knowledge)

Antibiotic Stewardship Program (ASP)

<table>
<thead>
<tr>
<th>Risks of inappropriate antibiotic use:</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Increased morbidity, mortality, length of stay</td>
</tr>
<tr>
<td>• Antibiotic resistance</td>
</tr>
<tr>
<td>• Adverse events, including <em>C. difficile</em> infections</td>
</tr>
<tr>
<td>• Increased direct and indirect costs of care</td>
</tr>
</tbody>
</table>

Human factors effect on quality of clinical decision making.
Decision fatigue progressively impairs clinician’s ability to resist ordering inappropriate treatments.

**Antibiotic Prescribing by Hour of the Day**

- **Antibiotics never indicated**: Acute Bronchitis, non-specific respiratory infection, influenza and non-streptococcal pharyngitis. P< 0.002 for antibiotics never indicated.

- **Antibiotics sometimes indicated**: Otitis Media, sinusitis, Pneumonia, and streptococcal pharyngitis. P< 0.001 for antibiotics sometimes indicated

Does the outcome of legal cases depend solely on laws and facts? Do judges apply legal reasons to the facts of a case with rational, mechanical, and machine-like logic?

Proportion of rulings in favor of the prisoners by ordinal position.

What kind of remedies may help this decision fatigue?
Remedies for Decision Fatigue

• Time-dependent decision support
• Modified schedules
• Shorter sessions
• Mandatory breaks
• Snacks*

## Burnout Effect on Cognitive Function

<table>
<thead>
<tr>
<th>Cognitive Function</th>
<th>Greatest impact Cohen's d value/Effect Size</th>
<th>Cohen's d range</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Switching</td>
<td>-1.06¹ / Large</td>
<td>0 to -1.06</td>
<td>Kind of cognitive flexibility that involves the ability to shift attention between one task and another</td>
</tr>
<tr>
<td>Updating</td>
<td>-0.93² / Medium</td>
<td>-0.39 to -0.93</td>
<td>Ability to respond in a flexible and adaptive manner in order to keep up with the changes in the environment</td>
</tr>
<tr>
<td>Inhibition</td>
<td>-0.78³ / Medium</td>
<td>0 to -0.78</td>
<td>The mind's ability to tune out stimuli that are irrelevant to the task/process at hand or to the mind's current state</td>
</tr>
<tr>
<td>Sustained Attention</td>
<td>-1.17⁴ / Large</td>
<td>0 to -1.17</td>
<td>Readiness to detect rarely and unpredictably occurring signals over prolonged periods of time</td>
</tr>
<tr>
<td>Control Attention</td>
<td>-0.93⁵ / Medium</td>
<td>0 to -0.93</td>
<td>An individual's capacity to choose what they pay attention to and what they ignore (concentration).</td>
</tr>
<tr>
<td>LT Memory</td>
<td>-1.49⁶ / Large</td>
<td>0 to -1.49</td>
<td>Information stored in the brain and retrievable over a long period of time, often over the entire life span of the individual</td>
</tr>
<tr>
<td>ST Memory</td>
<td>-0.74⁷ / Medium</td>
<td>0.03 to -0.74</td>
<td>System for temporarily storing and managing information required to carry out complex cognitive tasks such as learning, reasoning, and comprehension. Involved in the selection, initiation, and termination of information-processing functions such as encoding, storing, and retrieving data.</td>
</tr>
<tr>
<td>Working Memory</td>
<td>-0.16⁷ / Small</td>
<td>0.13 to -0.16</td>
<td>Not completely distinct from short-term memory. Especially refers to attentional component of ST memory. Combination of multiple components working together used to plan and carry out behavior</td>
</tr>
</tbody>
</table>

Negative Cohen’s values reflect associations between Burnout and cognitive impairment.

1. Oosterholt et al 2012
2. Sandstrom et al 2011
3. Dietzel et al 2013
4. Orena et al 2013
5. Morgan et al 2011
7. Johnsdottir et al 2013
Taxonomy of Human Error

- **Unintended Action**
  - **Slip**
  - **Lapse**
  - **Mistake**
    - **Attentional Failures**
    - **Memory Failures**
    - **Rule-Based Knowledge Based Mistakes**

- **Intended Action**
  - **Violation**
    - **Routine Violations**
      - **Exceptional Violations**
      - **Sabotage**

*(Reason, 1999)*

Affected by Neurocognitive effects of Burnout = ★
Are “All Staff Trained and at Full Efficacy” vs. Continuum of Individual, Task and Environmental Factors Affecting Individual and Patient Safety

How Can Leadership Awareness of Human Factors Improve Staff and Patient Safety?

Group together, each group pick one of four scenarios above. Reconvene and discuss ideas relevant to improving or maintaining clinician wellbeing and patient safety.
Components of Burnout by Degree

“High Burnout” Percentages

“I feel burned out from my work” (High Emotional Exhaustion)

<table>
<thead>
<tr>
<th>MD/DO</th>
<th>PhD/PsyD</th>
<th>APP</th>
<th>MS/MA</th>
</tr>
</thead>
<tbody>
<tr>
<td>42%</td>
<td>46%</td>
<td>52%</td>
<td>50%</td>
</tr>
</tbody>
</table>

“I’ve become more callous toward people since I took this job” (High Depersonalization)

<table>
<thead>
<tr>
<th>MD/DO</th>
<th>PhD/PsyD</th>
<th>APP</th>
<th>MS/MA</th>
</tr>
</thead>
<tbody>
<tr>
<td>32%</td>
<td>16%</td>
<td>45%</td>
<td>33%</td>
</tr>
</tbody>
</table>

What are the top two factors that most sustain your sense of meaning in your professional work?

“Sustaining” Themes Mentioned by Percentage of Respondents

Increased burnout & callousness with increased clinical FTE + clinical/patient work sustains meaning: Something is in the way of clinicians taking care of their patients!!
Current System’s approach to error:
Humans are fallible and errors are to be expected. Central idea is countermeasures, system defenses (layers of Swiss cheese). If all holes in the defenses line up in an unfortunate way, error occurs.
Swiss Cheese Model
On Steroids!

Measure Madness

LEGEND

ONE BAR REPRESENTS 5 MEASURES

- 33 Accountable Care Organization (ACO) Measures
- 100+ Delivery System Reform Incentive Payment (DSRIP) Measures
- 546 Private Health Plan Measures
- 635 National Quality Forum (NQF) Endorsed Measures
- 850 Centers for Medicare & Medicaid Services (CMS) Measures

(850 measures from CMS)

Integrative Model: Patient Safety and Staff Wellbeing

Positive Quality Producing Conditions

Contributory Factors Influencing Practice

Organization & Management Culture
- Work Environment
- Team
- Individual (staff)
- Task
- Patient

Management Decisions & Organizational Processes

National, state, industry, regulatory-imposed factors

Error & Violation Producing Conditions

Latent Failures*

Potential Care Delivery

Excellent care
Average Care
Poor care

Thwarted care
Chronic
Acute stress effect

Active Failures
Unsafe Acts
Errors
Violations

Unresolved Care Delivery Problems

Incident

Actualized Care Delivery

Excellent care
Average Care
Poor care

Defenses Barriers

KEY

* = Bio-psychosocial change of individual providing care: Burnout, depression, substances lack of sleep, emotional, time pressure, frustration.

| = Extraneous cognitive load. Well meaning but excessive or poorly designed guardrails/mandates/regulations that thwart care.

| = Well designed judicious use of defenses, Barriers.

*Latent Failures include poor design, installation, and maintenance of equipment, management decisions, and organizational functioning, and thwarted care leading to acute high stress and chronic high stress.


1. What are some examples of **well-meaning initiatives** in healthcare that thwart good care?
   - What are potential pathways to solutions?

2. What are examples of **not-so-well-meaning initiatives** in healthcare that thwart good care?
   - What are potential pathways to solutions?

Group together, pick either #1 or #2 above. Discuss with neighbor and reconvene to share findings. Discuss ideas and potential pathways to solutions for each.