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Modeling Caregiver Burnout and Resiliency to Optimize Prevention and Mitigation Intervention

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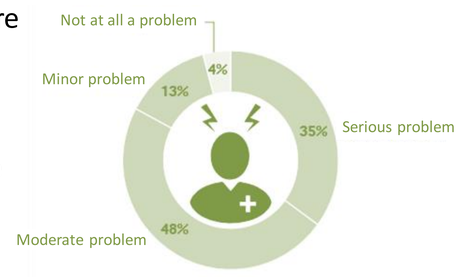
Opportunity and Impact

Literature has shown that there is significant correlation between healthcare staff burnout and patient safety.
It is a major problem for more than 80% of healthcare organizations



Source: Swensen, Strongwater, Mohta. (2018). Leadership Survey: Immunization Against Burnout. Insight report

Aim: Develop models to

I. Prioritize whom we should focus on
II. Decide when to intervene
III. Evaluate different interventions

This research addresses the problem of:
compromised patient safety, clinician burnout, and depression.

Literature Review Findings

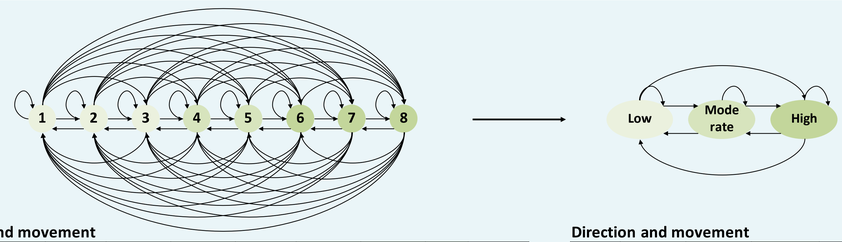
Topic	References	Conclusion
Burnout relation to safety	• Hall, L. H., Johnson, J., Watt, I., Tsipa, A., & O'Connor, D. B. (2016). Healthcare staff wellbeing, burnout, and patient safety: a systematic review. *PloS one*, *11*(7), e0159015. • Rogers, A. E., Hwang, W. T., Scott, L. D., Aiken, L. H., & Dinges, D. F. (2004). The working hours of hospital staff nurses and patient safety. *Health affairs*, *23*(4), 202-212. • Landrigan, C. P., Rothschild, J. M., Cronin, J. W., Kaushal, R., Burdick, E., Katz, J. T., ... & Czeisler, C. A. (2004). Effect of reducing interns' work hours on serious medical errors in intensive care units. *New England Journal of Medicine*, *351*(18), 1838-1848.	**Significant correlation between poor wellbeing and worse patient safety**
Measuring Burnout	• Kristensen, T. S., Borritz, M., Villadsen, E., & Christensen, K. B. (2005). The Copenhagen Burnout Inventory: A new tool for the assessment of burnout. *Work & Stress*, *19*(3), 192-207. • Maslach, C., Jackson, S. E., Leiter, M. P., Schaufeli, W. B., & Schwab, R. L. (1986). *Maslach burnout inventory* (Vol. 21, pp. 3463-3464). Palo Alto, CA: Consulting Psychologists Press. • Rassolian, M., Peterson, L. E., Fang, B., Knight, H. C., Peabody, M. R., Baxley, E. G., & Mainous, A. G. (2017). Workplace factors associated with burnout of family physicians. JAMA internal medicine, 177(7), 1036-1038.	**Maslach's Burnout Inventory is most common** and is divided into (1) depersonalization, (2) lack of personal accomplishment, and (3) emotional exhaustion
Modeling Burnout	• Cherniss, C. (1980). *Staff burnout: Job stress in the human services* (p. 21). Beverly Hills, CA: Sage Publications. • Golembiewski, R. T., Munzenrider, R., & Carter, D. (1983). Phases of progressive burnout and their work site covariants: Critical issues in OD research and praxis. *The Journal of applied behavioral science*, *19*(4), 461-481. • Leiter, M. P. (1989). Conceptual implications of two models of burnout: A response to Golembiewski. *Group & Organization Studies*, *14*(1), 15-22. • Cahoon, A. R., & Rowney, J. I. (1984). Managerial burnout: A comparison by sex and level of responsibility. *Journal of Health and Human Resources Administration*, 249-263. • Petrovic, V. S. (2011). Ways of preventing and overcoming burnout specialist of social and educational spheres. *Scientific Bulletin Volyn National University*, *17*, 130-135. • Rozbowsky, P., Semeraro, A., Cervai, S., Gregori, D., & Gabassi, P. G. (2000). The risk of burnout: A dynamic phase model. *Risk, Decision and Policy*, *5*(3), 203-214.	**Golembiewski's Phase Model is most developed (Burnout develops over time thus a process)** GOLEMBIEWSKI'S EIGHT-PHASE MODEL OF BURNOUT Maslach Subscales / Phase: I II III IV V VI VII VIII Depersonalization: Low High Low High Low High Low High Personal Accomplishment: Low Low High High Low Low High High Emotional Exhaustion: Low Low Low Low High High High High

Approach

Inverse Markov Chains (MC) – Aims I and II Modeling propagation of burnout without interventions	Markov Decision Processes (MDP) – Aim III Modeling propagation of burnout with interventions
✓ All States completely observable ✓ No Control over state transitions	✓ All states completely observable ✓ Interventions that will control state transitions
1. Distribute MBI surveys to same population at month 1 and month X. 2. Map results to 8-phase model 3. Work backwards from initial state (P_0), power (P^x) or steady state (P_π) to get the transition matrix 4. Investigate with experts on adding constraints to the optimization problem 5. From the transition matrix, insight on when to intervene and whom to focus on will be gained.	**MBI results tell us what our intervention should tackle:** • Workload • Control • Reward • Community (e.g. social networks) • Fairness • Values 1. Create scenarios with interventions in each of the 6 aspects 2. Conduct focus groups and structured interviews to predict consequences of interventions.

Preliminary Results for Inverse Markov Chains

Inputs



Direction and movement

P	1	2	3	4	5	6	7	8	Total
1	46	5	4	1	6	2	4	1	69.000
2	5	7	0	0	2	4	0	3	21.000
3	10	1	12	7	0	0	2	4	36.000
4	5	3	4	9	1	1	1	6	30.000
5	8	1	3	1	6	5	0	3	27.000
6	2	2	1	0	7	15	1	9	37.000
7	1	0	3	0	5	1	2	5	17.000
8	3	2	3	8	3	10	6	35	70.000
Total	80	21	30	26	30	38	16	66	307

P^12

P	1	2	3	4	5	6	7	8	Sum
1	0.67	0.07	0.06	0.01	0.09	0.03	0.06	0.01	1.000
2	0.24	0.33	0.00	0.00	0.10	0.19	0.00	0.14	1.000
3	0.28	0.03	0.33	0.19	0.00	0.00	0.06	0.11	1.000
4	0.17	0.10	0.13	0.30	0.03	0.03	0.03	0.20	1.000
5	0.30	0.04	0.11	0.04	0.22	0.19	0.00	0.11	1.000
6	0.05	0.05	0.03	0.00	0.19	0.41	0.03	0.24	1.000
7	0.06	0.00	0.18	0.00	0.29	0.06	0.12	0.29	1.000
8	0.04	0.03	0.04	0.11	0.04	0.14	0.09	0.50	1.000

P_0	0.225	0.068	0.117	0.098	0.088	0.121	0.055	0.228
P_{12}	0.2606	0.0684	0.0977	0.0847	0.0977	0.1238	0.052	0.215

Direction and movement

P	1	2	3	Sum
1	90.0	16.0	20.0	126.0
2	24.0	17.0	16.0	57.0
3	17.0	23.0	84.0	124.0
Total	131.0	56.0	120.0	307.0

P^12

P	1	2	3	Sum
1	0.71	0.13	0.16	1.00
2	0.42	0.30	0.28	1.00
3	0.14	0.19	0.68	1.00

P_0

0.410	0.186	0.404

P_{12}

0.4267	0.18241	0.3909

Steady State Calculated

0.45	0.18	0.38

Literature Steady State

0.456	0.122	0.421

Output

Objective function is to minimize the difference between the input and calculated P_0, P^x or P_π

Using power, steady state and initial state, can reach the transition matrix (desired output)

Transition matrix

P	1	2	3	Sum
1	0.675	0.021	0.304	1.000
2	0.750	0.202	0.048	1.000
3	0.009	0.206	0.785	1.000

Next Steps:

- Data collection
- Refining MC model
- Develop guidelines from MC output
- Create MDP model

HSyE

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