NORTHWEST PATIENT SAFETY CONFERENCE • MAY 1, 2018 • SEATTLE, WASHINGTON

IMPROVING THE QUALITY OF RCA ACTION PLANS: AN APPLICATION OF THE HADDON MATRIX

Jonathan D. Stewart, J.D., M.S., RN, CPPS, CPHRM

Vancouver, Washington | BETA Healthcare Group

Gary L. Sculli, M.S.N., RN, ATP

Ann Arbor, Michigan | Veterans Health Administration

Alan J. Card, Ph.D., M.P.H., CPHQ

San Diego, California | University of California

OBJECTIVES

Apply the Haddon Matrix for Health Care to

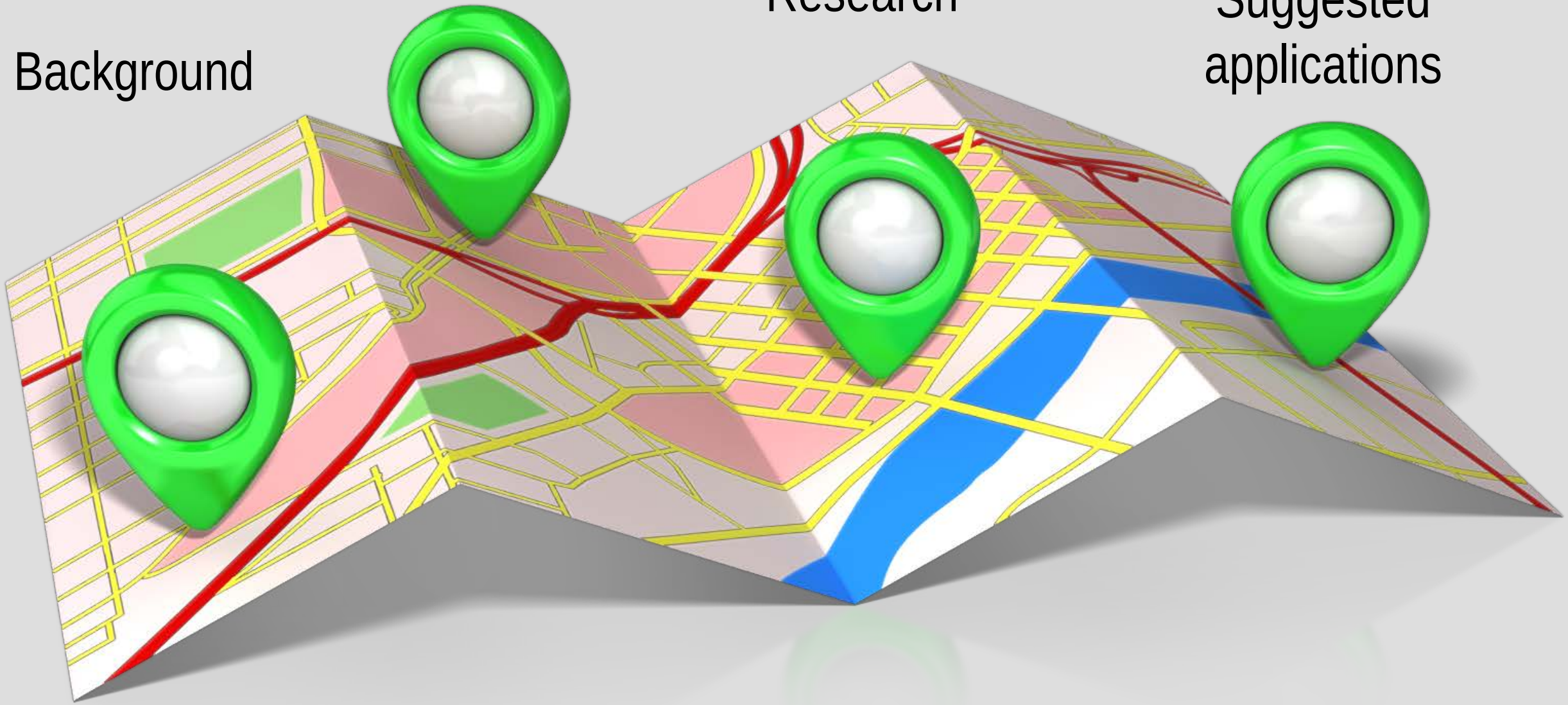
- Evaluate the quality of your organization's RCA action plans, and
- Improve the quality of RCA action plans by prompting teams to consider additional temporal and factorial dimensions

Haddon Matrix for Health Care

Background

Research

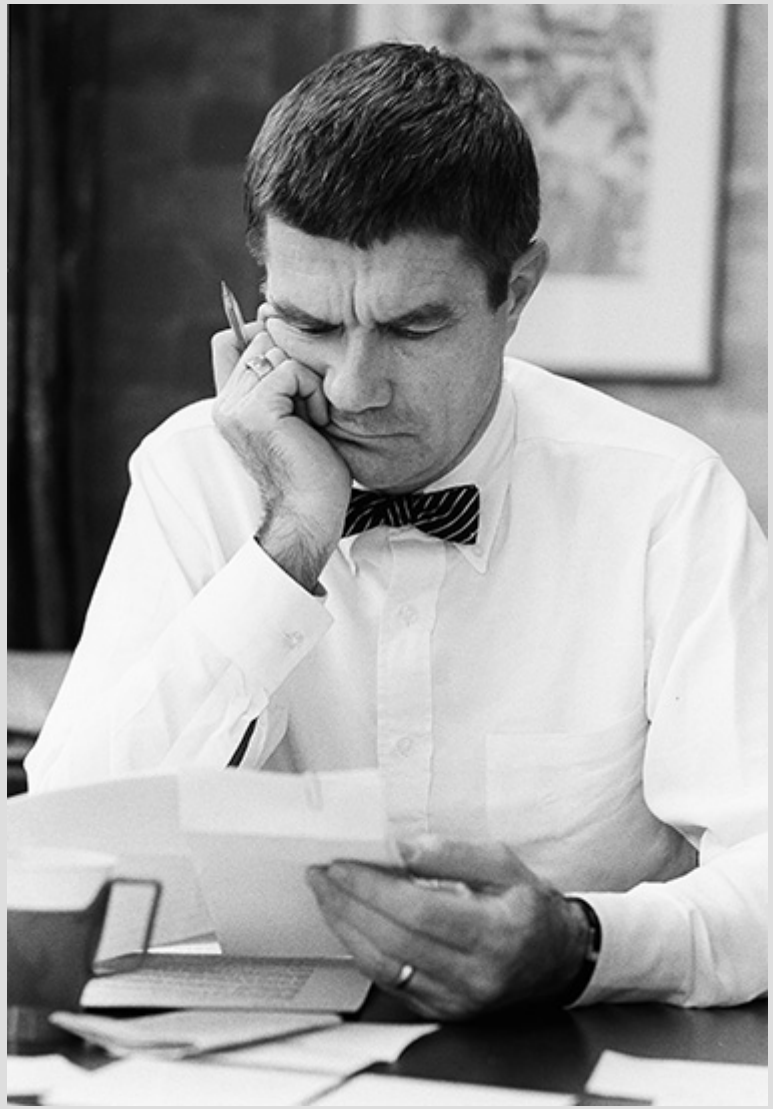
Suggested applications



BACKGROUND

WILLIAM HADDON, JR., M.D.

First head of the U.S. National Highway Traffic Safety Administration (1967-1969) and president of the Insurance Institute for Highway Safety (1969-1985)



IIHS. (n.d.) Retrieved from http://www.iihs.org/iihs/sr/statusreport/article/36/7/3

THE HADDON MATRIX

THE JOURNAL OF TRAUMA
Copyright © 1972 by The Williams & Wilkins Co.
Vol. 12, No. 3
Printed in U.S.A.

A LOGICAL FRAMEWORK FOR CATEGORIZING HIGHWAY SAFETY PHENOMENA AND ACTIVITY

WILLIAM HADDON, JR., M.D.
President, Insurance Institute for Highway Safety, Washington, D. C.

Highway safety is a social issue, not because vehicles crash, but because of the losses in damaged people and property. As we shall see, these are logically discrete issues. Moreover, reducing losses can commonly be far more effectively achieved by means other than by attempting to reduce the occurrence of crashes. Unfortunately, the almost universal failure to understand this distinction and its programmatic implications has consigned millions of men, women, and children to death, hundreds of millions to nonfatal injury, and in the United States alone is resulting in more than $100,000,000,000 in *unnecessary* economic losses each decade (author's estimate).

In the United States alone, known motor vehicle crash deaths since the advent of the motor vehicle about seven decades ago will reach 2,000,000 in about 1973 (Insurance Institute for Highway Safety estimate).

Injuries in the United States alone, according to continuing government survey (the only scientifically based measurement of their magnitude), average almost 10,000 per day, or about 4,000,000 per year (current estimates from Health Interview Survey, U.S. 1967, U. S. Dept. of Health, Education, and Welfare, Public

tolerate without damage. The many commonplace illustrations of energy-exchange damage include those produced in fires; in war and individual violence; in storms and earthquakes; in stubbing one's toe; in sunburn; in falls of elevators and window washers; in shipping improperly packaged articles by mail; in explosions of hazardous cargoes; and in unnecessarily abrupt decelerations of road and space vehicles and their contents, especially if those contents are improperly packaged.

Throughout history, man has empirically recognized that energy-damage losses result from a sequence of three phases of interactions of the factors involved (3). For this discussion the first phase can be conveniently labeled "The Pre-Event Phase." In this period are operative the various factors that determine whether potentially damaging energy exchanges will actually take place. For example, whether postal packages will be dropped; sunlight will reach bare skin; elevator cables will break; fires will be ignited; electrical short-circuits will occur; acrobats will fall; construction workers will be hit on their heads; or vehicles will crash.

Many commonplace loss reduction measures seek the modification of Pre-Event interactions

FACTORS

PHASES	Human	Vehicle and Equipment	Environment
Pre-Crash			
Crash			
Post-Crash			
Results ⇨			

FIG. 3. Basic "first" matrix for classification of road loss factors in each of the three phases of interactions that lead to the end results in energy-damaged people and property.

FACTORS

PHASES	Human	Vehicle and Equipment	Environment
Pre-Crash	1	4	7
Crash	2	5	8
Post-Crash	3	6	9
Results ⇨			

FIG. 4. Basic "first" matrix for classification of road loss factors with arbitrary element (cell) numbers assigned for convenience of description.

trauma of *all* kinds, and for medical emer-
s of other types as well (6); substantially
r requirements for helmets, whether for
cyclists, athletes, soldiers, or construction
rs; and, among many others, the high tol-
e to mechanical forces of the properly

Figure 5 shows the percentages of actual front end passenger car crashes at various speeds in which drivers sustained injuries of various severities in the series of crashes studied. The data are divided by whether the driver crashed in a car with or without an energy-absorbing steering

THE HADDON MATRIX

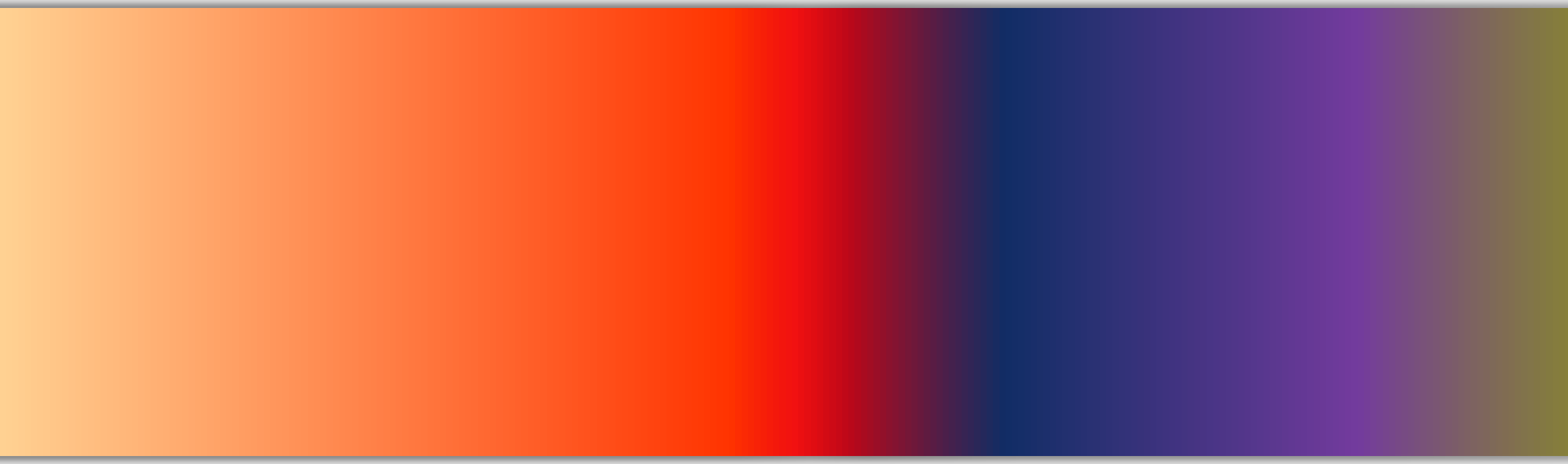
		FACTORS		
		Human	Vehicle and Equipment	Environment
PHASES	Pre-Crash			
	Crash			
	Post-Crash			

HADDON MATRIX FOR HEALTH CARE

TEMPORAL ASPECT

Pre-event phase

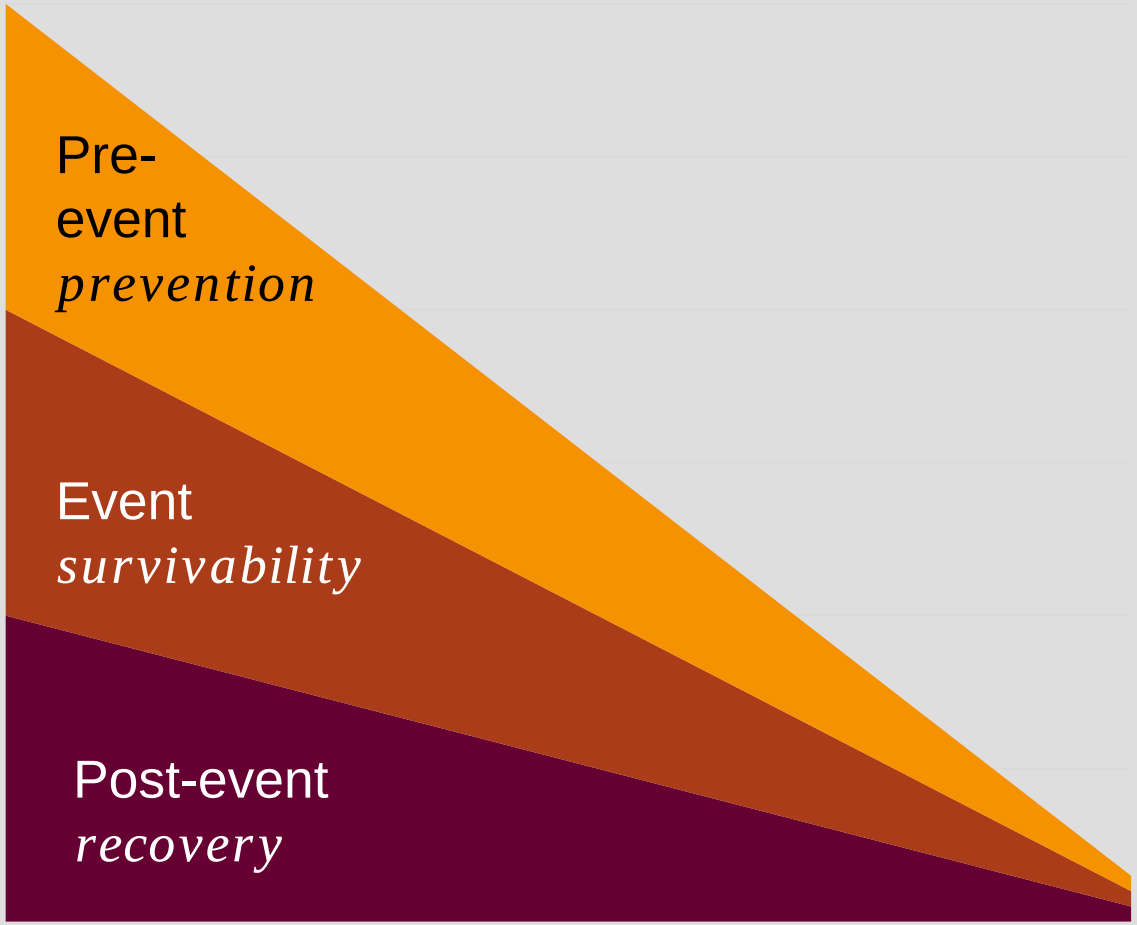
Post-event phase

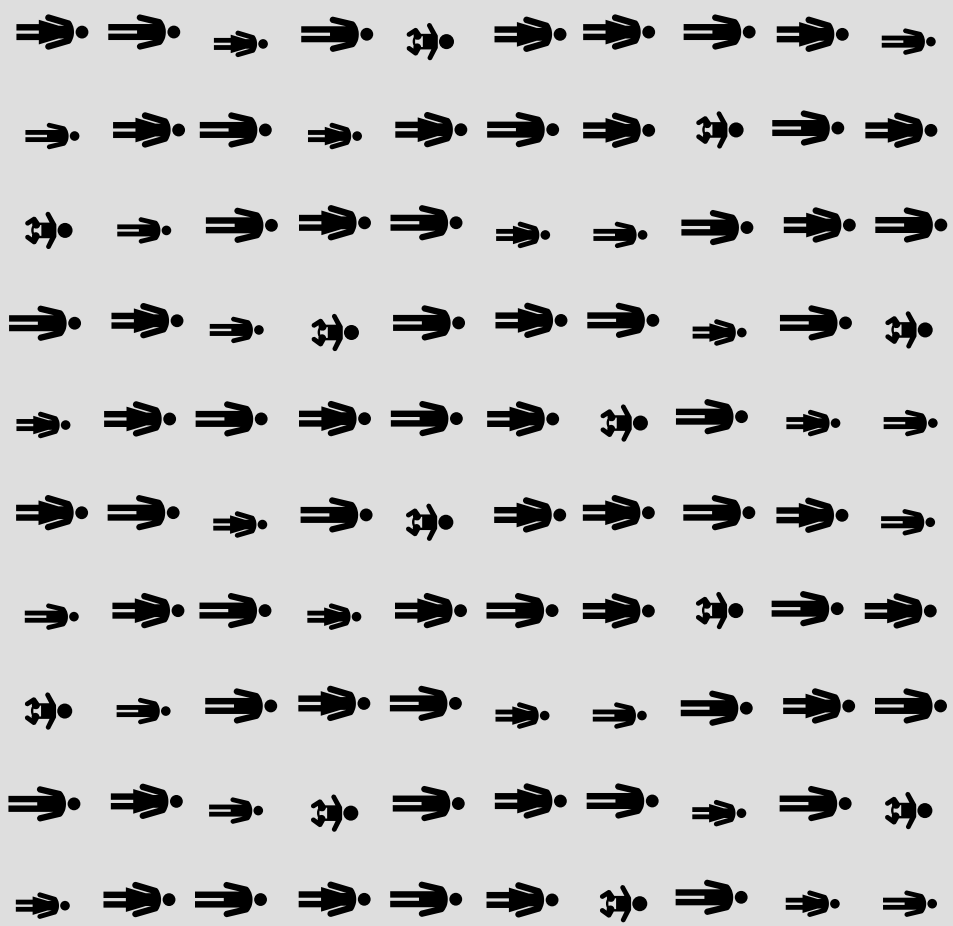


Event phase

“Human error cannot be eliminated from the clinical setting. Systems can be designed to help individuals avoid error and minimize the harmful effect of errors.”

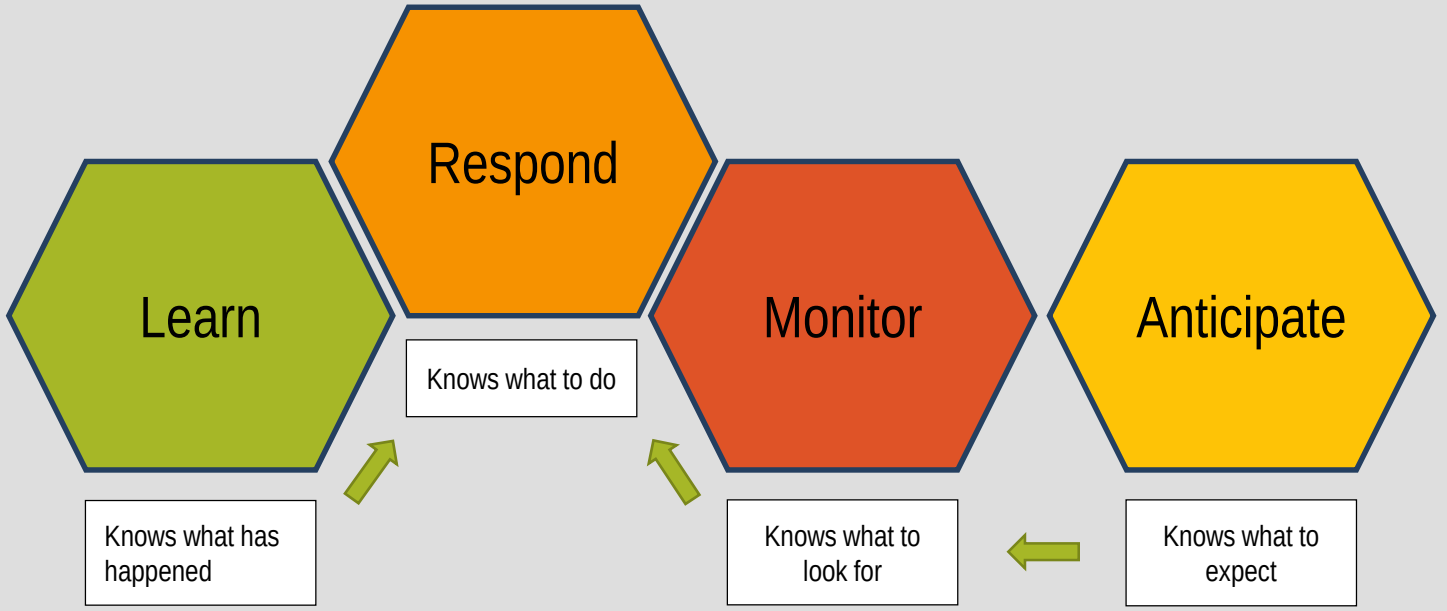
World Health Organization, 2008


Pre-
event
prevention
Event
survivability
Post-event
recovery



FUNCTIONS OF A RESILIENT SYSTEM

FUNCTIONS OF A RESILIENT SYSTEM



Erik Hollnagel, et al

FUNCTIONS OF A RESILIENT SYSTEM

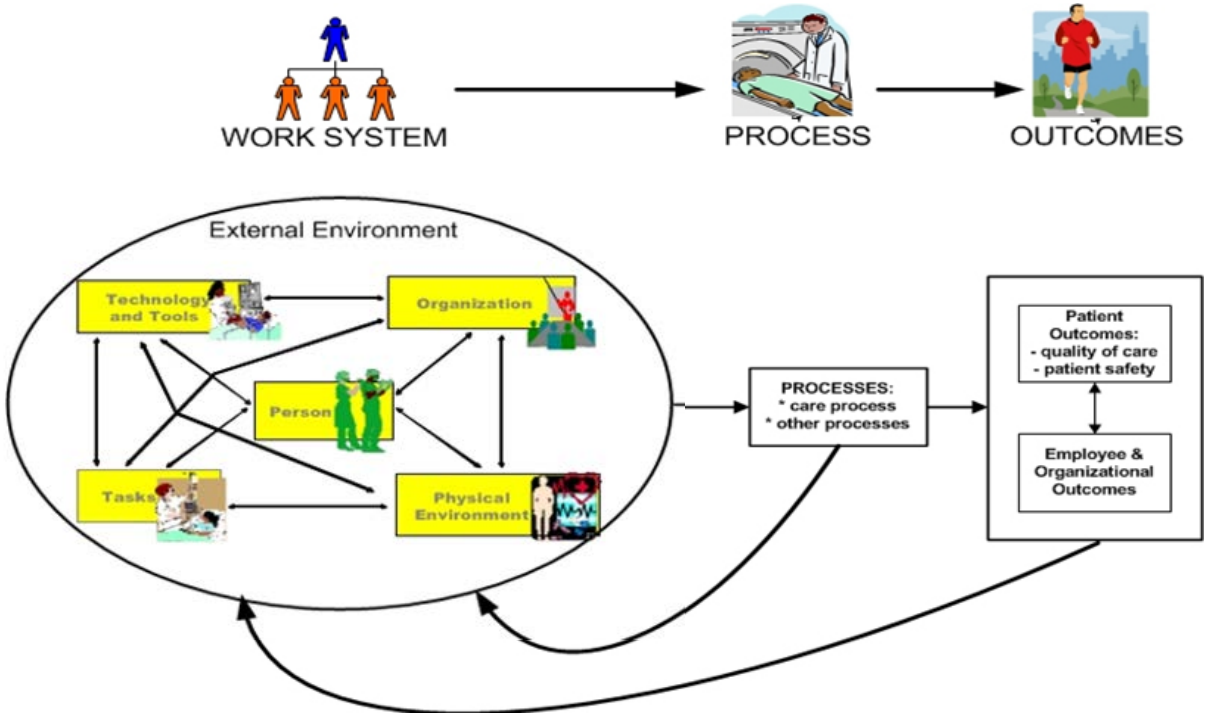
	Anticipate	Monitor	Respond	Learn
Pre-event	✓	✓		
Event			✓	
Post-event				✓

FACTORIAL ASPECT

PHASES	FACTORS		
	Human	Vehicle and Equipment	Environment
Pre-Crash			
Crash			
Post-Crash			

SYSTEM ENGINEERING FOR PATIENT SAFETY (SEIPS)

Caryon, P., Schoofs, A., Karsh, B., Gurses, A., Alvarado, C., Smith, M. & Brennan, P. (2006). Work system design for patient safety: the SEIPS model. *BMJ Quality & Safety, 15(Suppl):*i50-i58. doi: 10.1136/qshc.2005.015842



HADDON MATRIX FOR HEALTH CARE 1.0

Phases	*Factors*				
	Patient	Mechanism of Injury	System		
			Physical	Equipment & technology	Socio-cultural
Pre-Event					
Event					
Post-Event					

Pre-Event
Pre-event action items attempt to **decrease the probability** of an adverse event
Event
Event and *post-event* action items attempt to **increase the survivability** of an adverse event by **improving detectability** or **decreasing severity**
Post-Event
Event and *post-event* action items attempt to **improve recovery** from an adverse event by **reducing harm** after the event phase

Factors		
Patient	**Mechanism of Injury**	**System**
Includes all variables that make patients more or less vulnerable to harm, both physiological factors (e.g., general state of health, mobility, immunization status) and psychosocial factors (e.g., health literacy level, cognitive functioning, barriers to communication).	The agent of injury is energy (e.g., mechanical, thermal, chemical, gravitational) that is transmitted to the patient (victim) through an inanimate object (“vehicle”) or a person (“vector”).	Includes all aspects of human interface with the physical setting in which the injury event takes place, biomedical devices, computer software and hardware, medical records, and communication systems, and the application of written policies, standard procedures and routine practices; organizational and unit culture; legal, regulatory and accreditation requirements.

GOAL: PREVENTING OVER-SEDATION OUTSIDE THE O.R.

Patient	☑	
Mechanism of injury	☑	
System	☑	☑

GOAL: PREVENTING **MORBIDITY AND MORTALITY** FROM OVER-SEDATION OUTSIDE THE O.R.

Patient	☑		☑
Mechanism of injury	☑	☑	
System	☑	☑	☑

GOAL: PREVENTING **HARM** DUE TO OVER-SEDATION OUTSIDE THE O.R.

Patient	☑	☑		☑	
Mechanism of injury	☑	☑			
System	☑	☑	☑	☑	☑

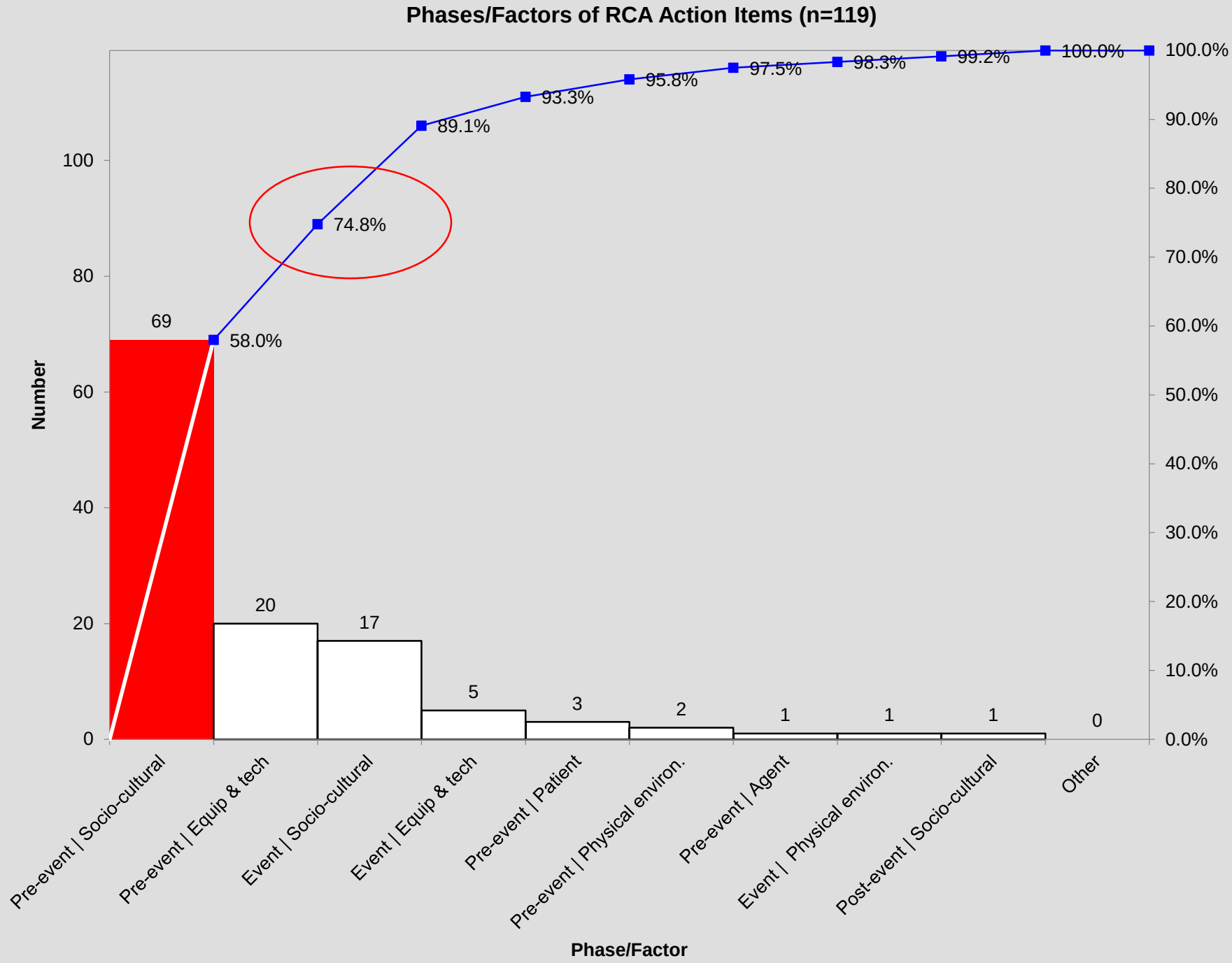
ANALYSIS OF CLOSED RCAs

METHODS

- Forty-two (**42**) RCAs were randomly selected from the register of all RCAs conducted in 2014 and 2015 among the eight medical centers within a health system region in the Pacific Northwest.
- The sample of RCAs contained **135 action items**, 119 of which were both unique and actionable and were therefore coded.
- Each RCA produced an average of **3.15** action items (**range 1 – 8, median 3**).

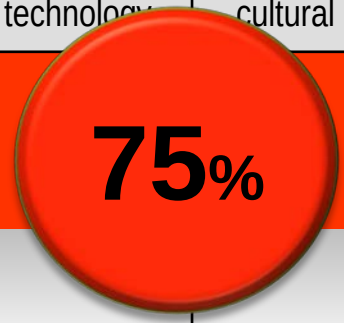
RESULTS

- The majority (58%) of RCA action items addressed the *pre-event social environment* (which includes policies, procedures, training, and risk awareness among staff).
- An additional 16.8% addressed *pre-event equipment and technology* factors.


Phases/Factors of RCA Action Items (n=119)
Number
Phase/Factor
100
80
60
40
20
0
100.0%
90.0%
80.0%
70.0%
60.0%
50.0%
40.0%
30.0%
20.0%
10.0%
0.0%
69
20
17
5
3
2
1
1
1
0
58.0%
74.8%
89.1%
93.3%
95.8%
97.5%
98.3%
99.2%
100.0%
Pre-event | Socio-cultural
Pre-event | Equip & tech
Event | Socio-cultural
Event | Equip & tech
Pre-event | Patient
Pre-event | Physical environ.
Pre-event | Agent
Event | Physical environ.
Post-event | Socio-cultural
Other

RESULTS

Phases	*Factors*				
	Patient	Mechanism of Injury	System		
			Physical	Equipment & technology	Socio-cultural
Pre-Event					
Event					
Post-Event					



RESULTS

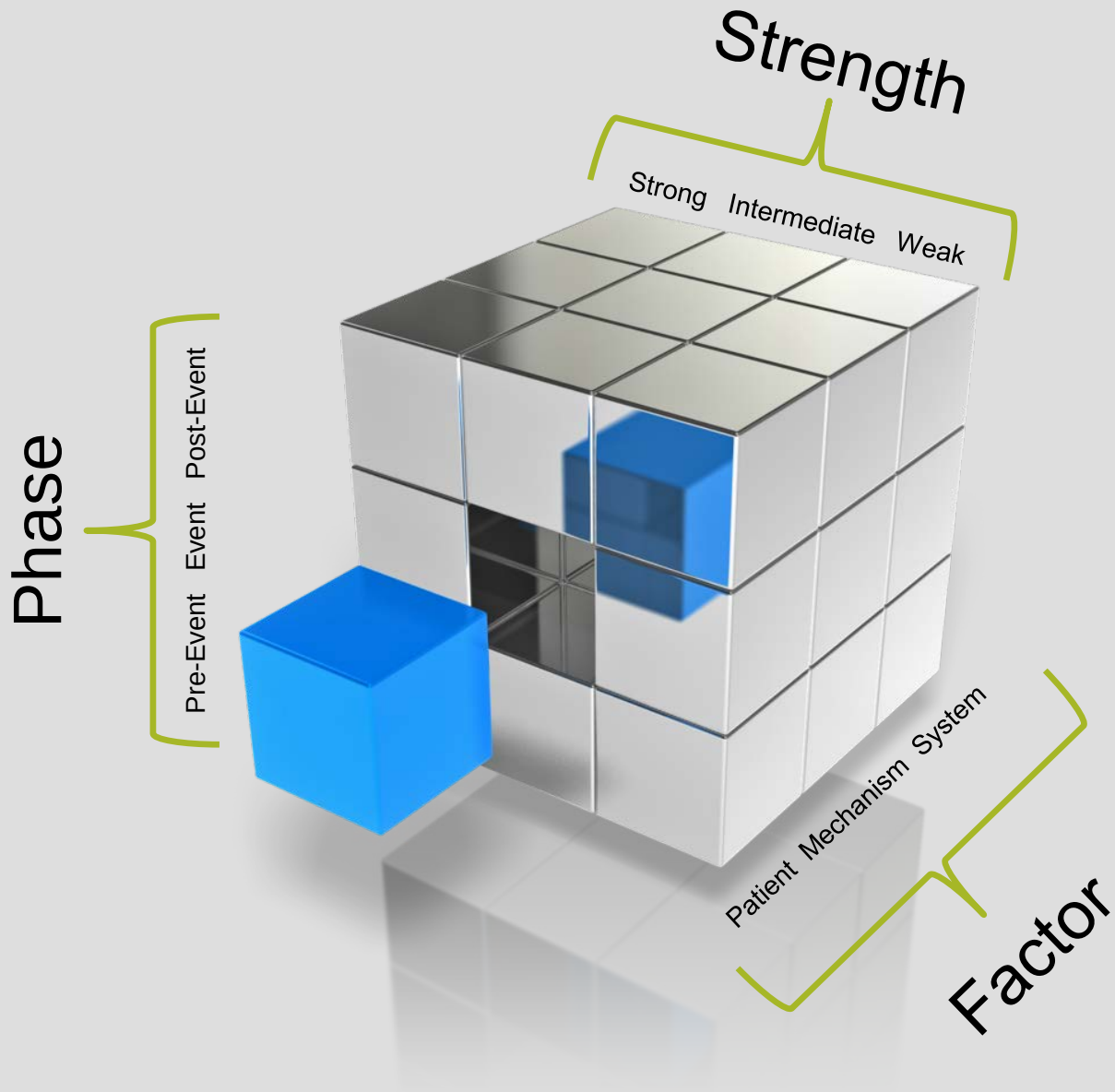
In this sample, only ¼ of RCA action items attempted to increase the *survivability of* or *recovery from* adverse events if they did occur.

IMPLICATIONS FOR PRACTICE

RECOMMENDATION #1

Ensure that RCA action plans consider not only system factors but also patient and mechanism-of-injury factors

PLANNING AND ASSESSING RCA ACTION ITEMS IN THREE DIMENSIONS



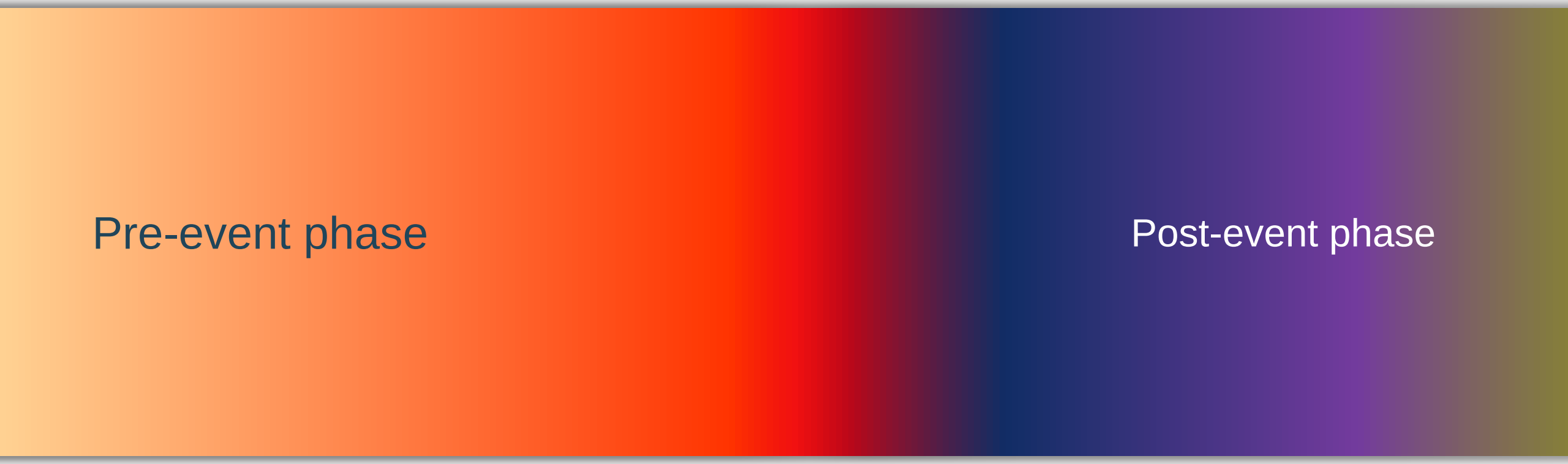
RECOMMENDATION #2A

Use the Haddon Matrix's temporal dimension (pre-event, event, post-event) to draw attention to the need for RCA action plans to address improving *survivability of* and *recovery from* adverse events, not merely prevention

RECOMMENDATION #2B

Evaluate in your organization: Are improvement plans developed in response to adverse events restricted to proximal causes? And are sequelae ignored as being out-of-scope?

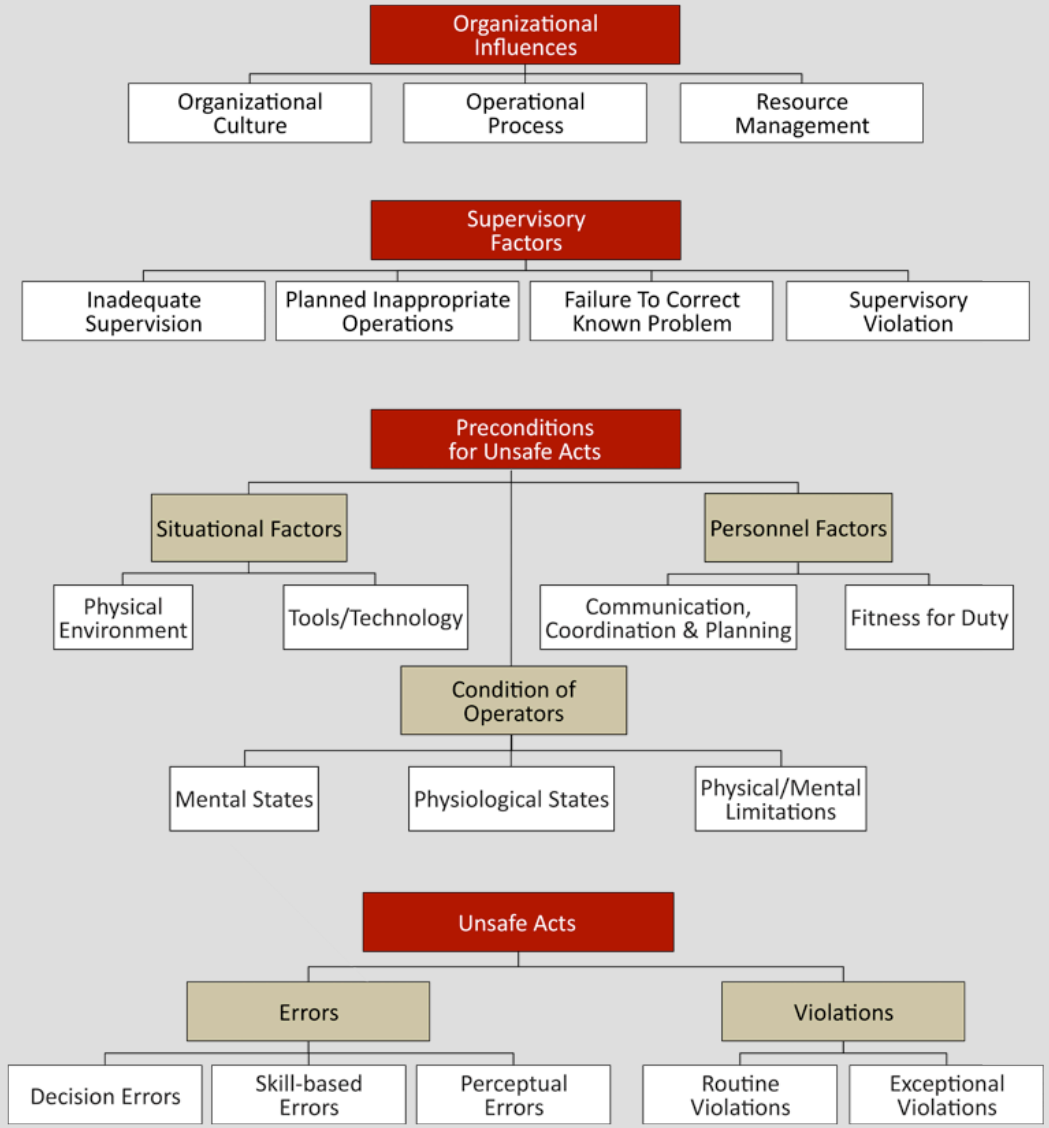
Typical scope of event analysis/RCA and improvement plan



Event phase

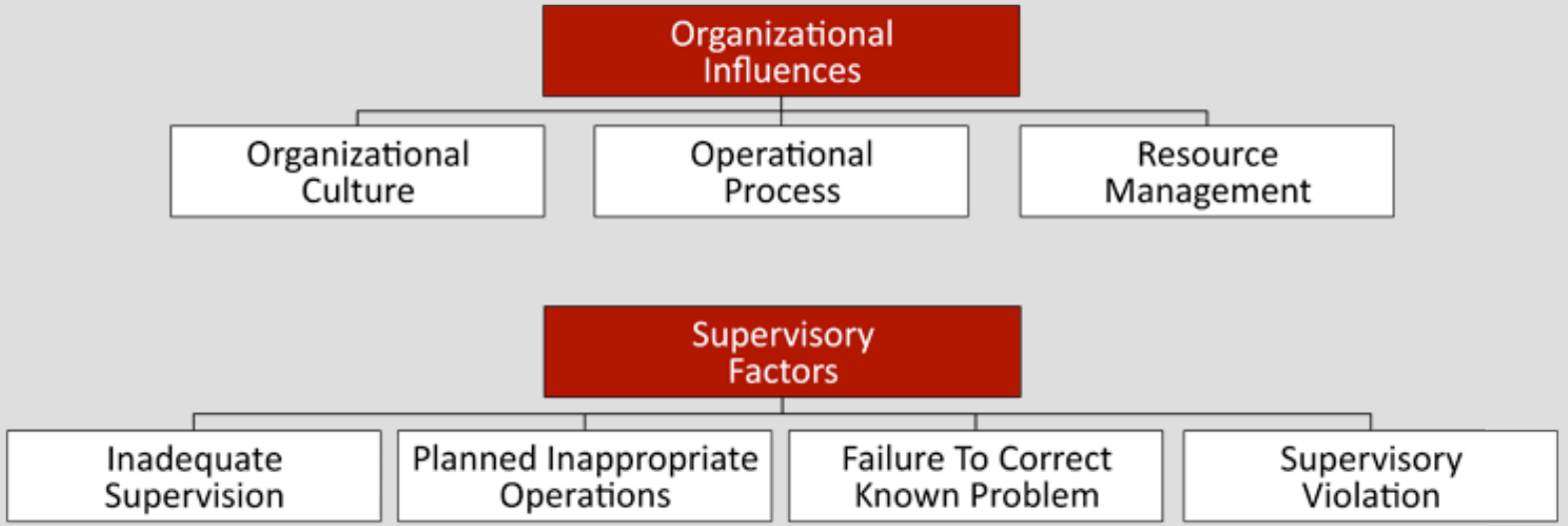
SUPERVISION AND ORGANIZATIONAL INFLUENCES

The Human Factors Analysis and Classification System (HFACS) Framework



HFACS, Inc. (2014). *The HFACS Framework*. Retrieved from https://hfacs.com/hfacs-framework.html

The Human Factors Analysis and Classification System (HFACS) Framework



HFACS, Inc. (2014). *The HFACS Framework*. Retrieved from https://hfacs.com/hfacs-framework.html

COMMUNICATION AND EARLY RESOLUTION

Adverse Event

Post-event phase

Open a line of communication with patient & family

Begin investigation immediately

Provide emotional fist aid to traumatized colleagues PRN

Preserve trust of patient, family and community

Timely and fair resolution

Organizational learning and meaningful improvement

Resilient and engaged workforce

HADDON MATRIX FOR HEALTH CARE 2.0

Phases	*Factors*					
	Patient	Mechanism of Injury	System			
			Physical environment	Equipment & technology	Socio-cultural	Tasks
Pre-Event						
Event						
Post-Event						

Stewart, J.D., Sculli, G.L. & Card, A.J. (2018)

THANK YOU!

Jonathan D. Stewart

Director, Risk Management & Patient Safety

BETA Healthcare Group

Vancouver, Washington

jonathan.stewart@betahg.com