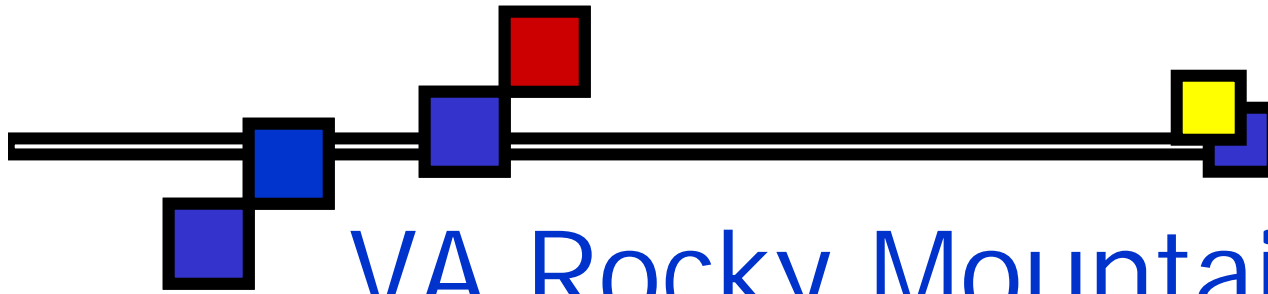


Retrospective Review of Human Factors Associated with Adverse Events

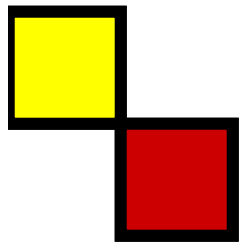


Teresa Blomberg, MS, RN, CPHQ

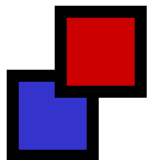
Patient Safety Officer - VHA Rocky Mountain Network

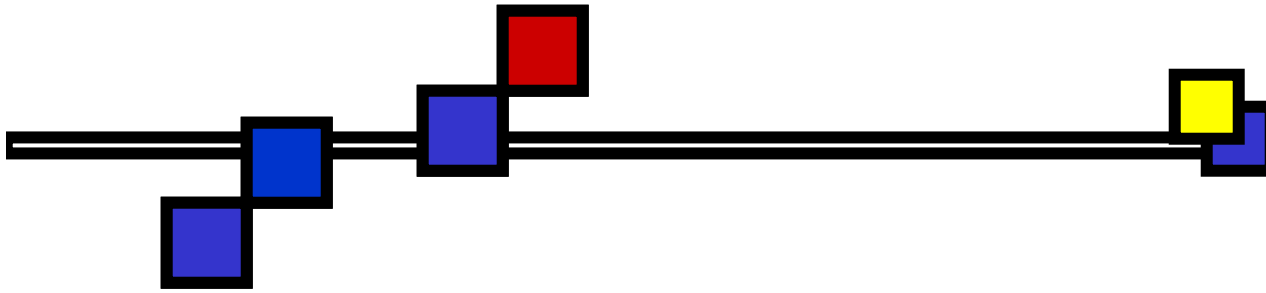


VA Rocky Mountain Network



- One of 21 divisions within the Department of Veterans' Healthcare Administration (VHA)
- Serves veterans in Colorado, Utah, Wyoming, Montana
- 6 medical centers
- 6 extended care facilities
- 31 community based outpatient facilities

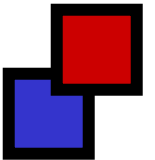


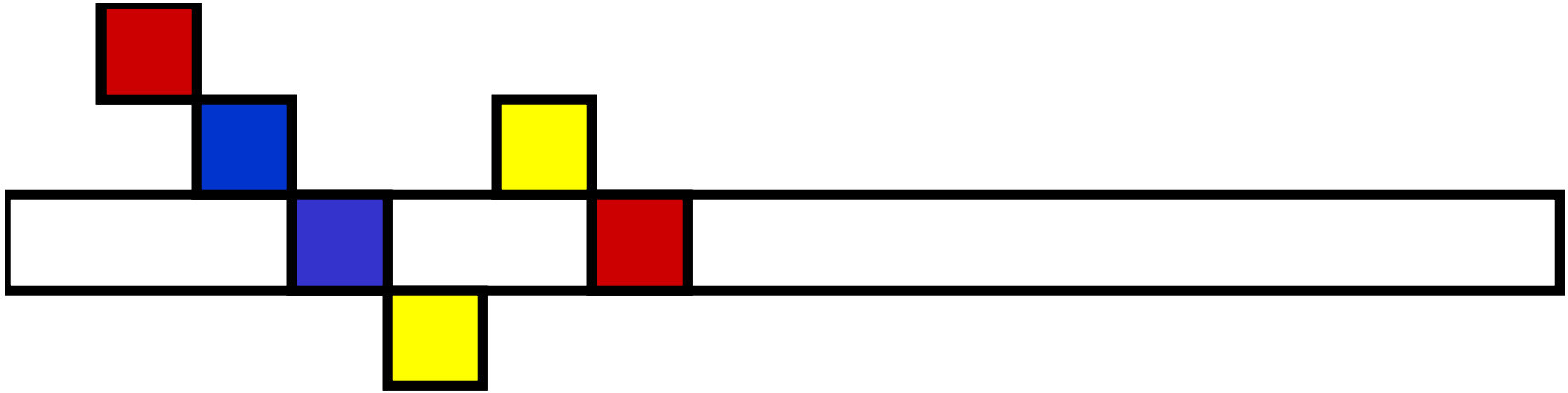


Objective

- Prevent future adverse events by identifying common factors that contributed to past events

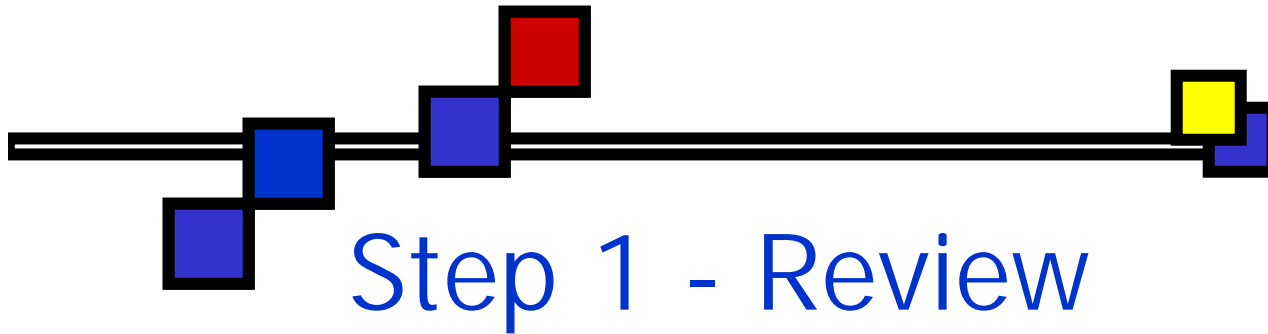
...using human factor analysis



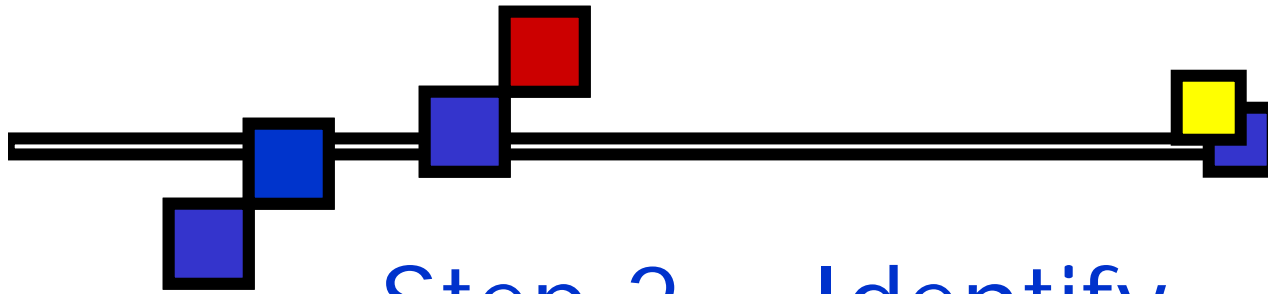


Methodology





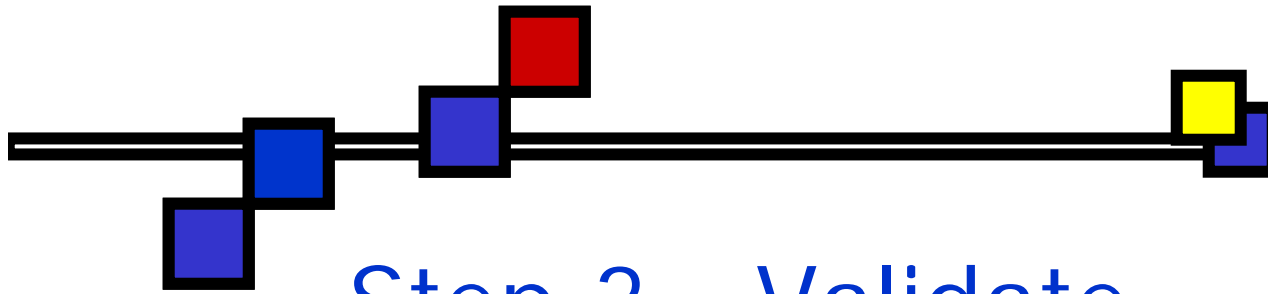
- 103 individual Root Cause Analyses (RCAs) from across the Network that occurred from 2001 to 2003
- Collate the root causes/contributing factors by human factor category
 - Across all events
 - Within event categories-falls, meds, etc



Step 2 – Identify

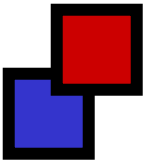
- The top 20% most frequently occurring human factors
 - Across all events
 - Within event categories

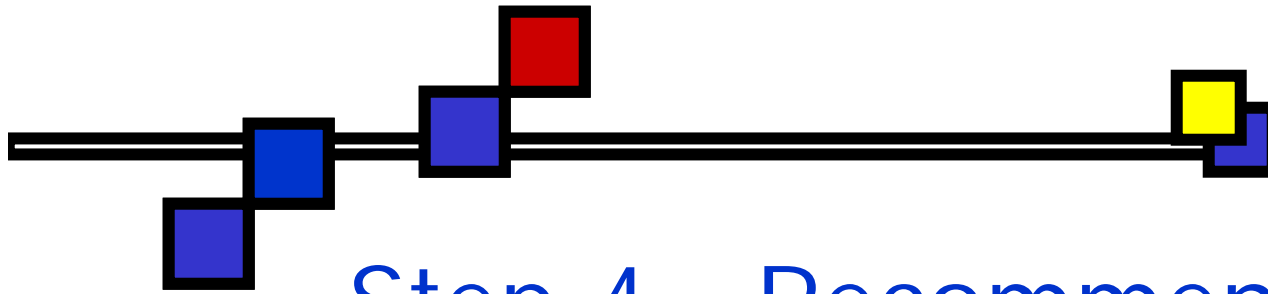
Employing the rule that 20% of defects cause 80% of the problems (Pareto/Juran Principle)



Step 3 - Validate

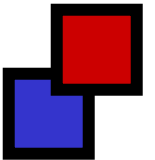
- That actions recommended in the RCAs were truly put into place & were effective
 - Would need to discount some factors if actions were never taken





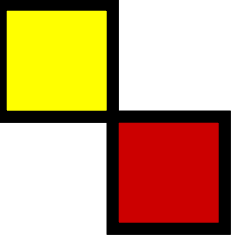
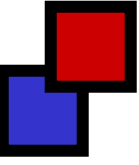
Step 4 - Recommend

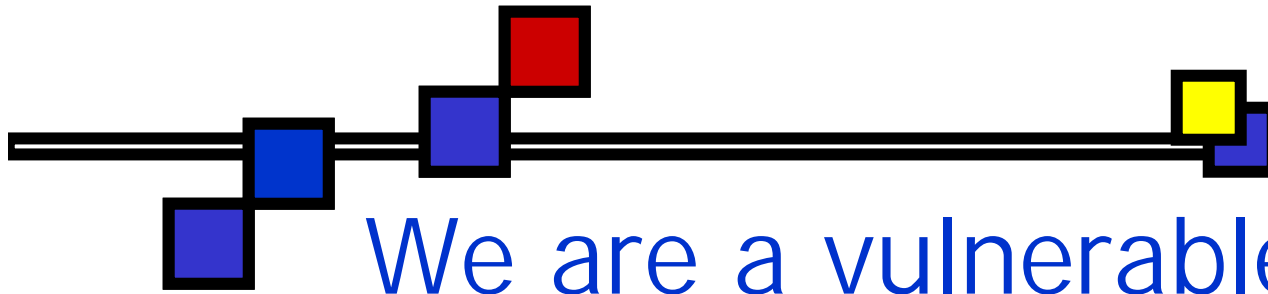
- Systems changes to prevent future adverse events
 - May be a:
 - Process/policy change
 - Equipment purchase
 - Other standardization across the Network





Why look at Human Factors?

- 
- Human factor engineering provides a framework to:
 - Uncover hidden vulnerabilities in a process
 - Identify situational elements from the environment that become the foundation for error
 - Detect factors that predispose processes to future errors
 - It is the basis of the VA Patient Safety Program 
 - Questions on adverse events are answered by the RCA team based on human factors
 - Every root cause or contributing factor listed in an RCA is aligned with one or more of these human factors



We are a vulnerable lot...

- As humans:

- We do work when we are tired
- Our brains default to what looks familiar-even if it isn't what we think it is
 - Example: In low lighting conditions, a grey CO2 cylinder may look like a green O2 cylinder
- In healthcare we work in increasingly complex, technical & fast-paced settings

This requires work systems be designed to disallow normal human failings

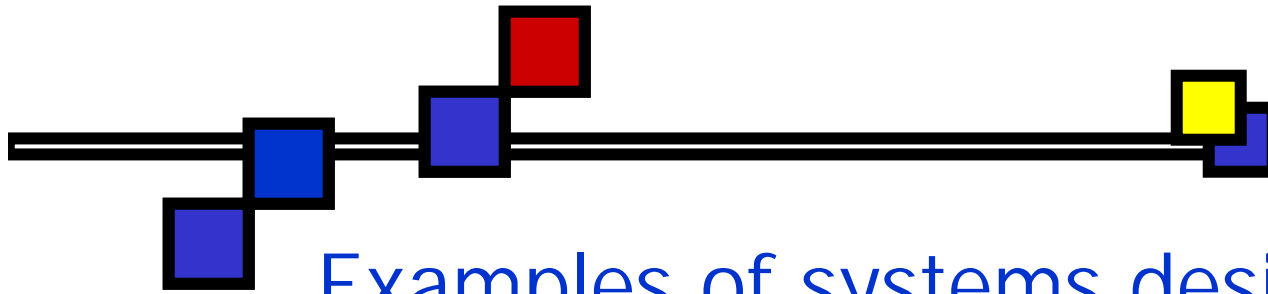


What is Human Factors Engineering?

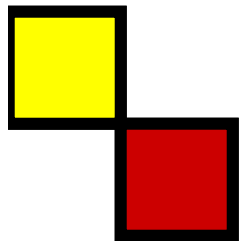
- Designing systems to support good human performance,

...not block it.

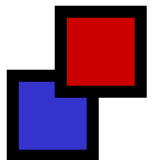


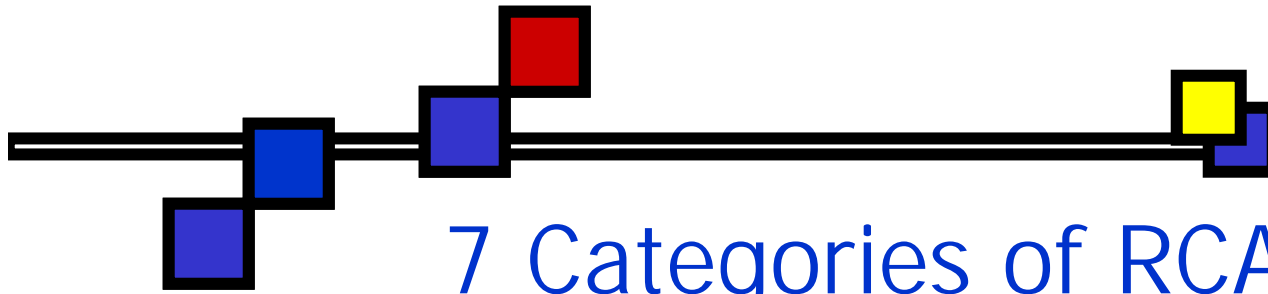


Examples of systems design built on Human Factor Engineering

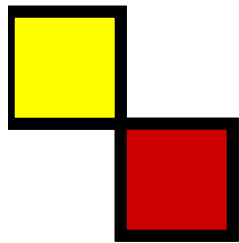


- Standardization/simplification
- Eliminate look-alike/sound-alikes
- Forcing functions (lock-outs/time-outs)
- Checklists
- Structured communication (read-backs)
- Enhanced visual cues (distinctive packaging)

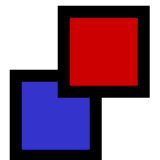




7 Categories of RCA Events Reviewed



- Falls – 9 RCAs
- Medications – 14 RCAs
- Elopements – 5 RCAs
- Para-Suicidal – 19 RCAs
- Delayed Treatment – 17 RCAs
- Equipment Related – 18 RCAs
- Other – 21 RCAs

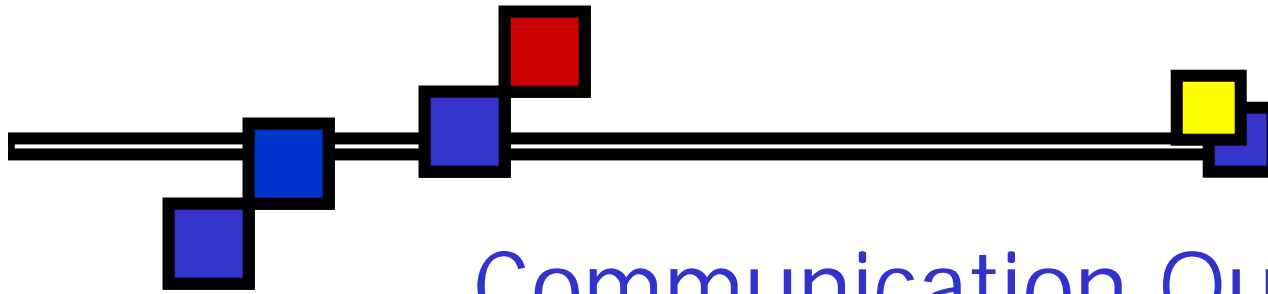


Severity of injuries in the RCAs spanned full spectrum, from none to catastrophic

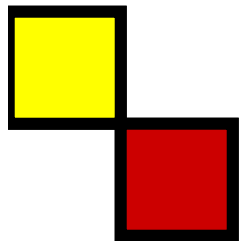


6 Categories of Human Factors Used in This Project

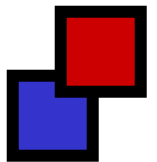
- Communication – 14 Factors in category
- Training – 8 Factors
- Fatigue/Scheduling – 8 Factors
- Equipment/Environment – 23 Factors
- Rules/Policies/Procedures – 13 Factors
- Barriers – 12 Factors

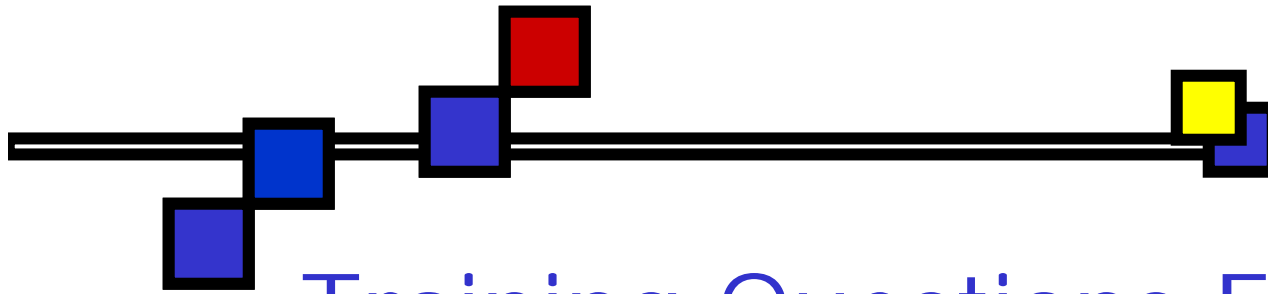


Communication Questions Examples

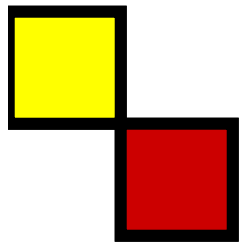


- Was the patient correctly identified?
- Was information from various patient assessments shared and used by members of the treatment team on a timely basis?

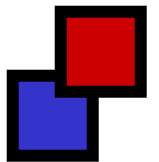


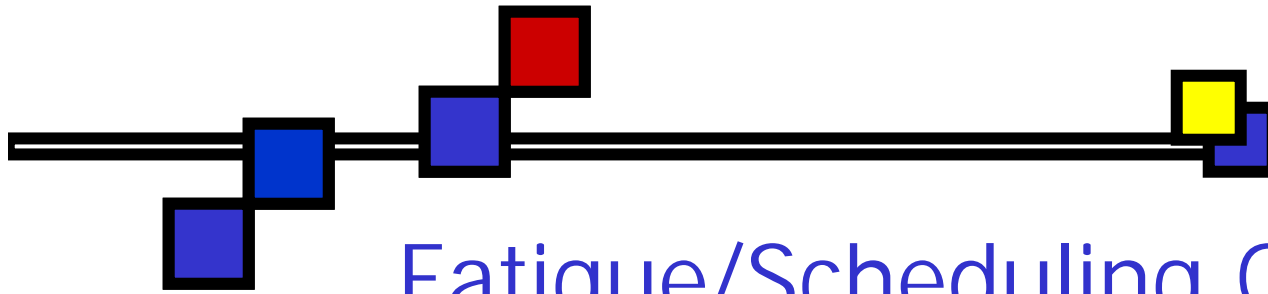


Training Questions Examples

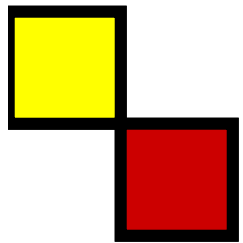


- Was there a program to identify what is needed for training of staff?
- Was training provided prior to the start of the work process?
- Were the results of training monitored over time?

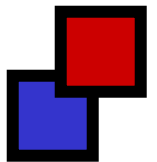


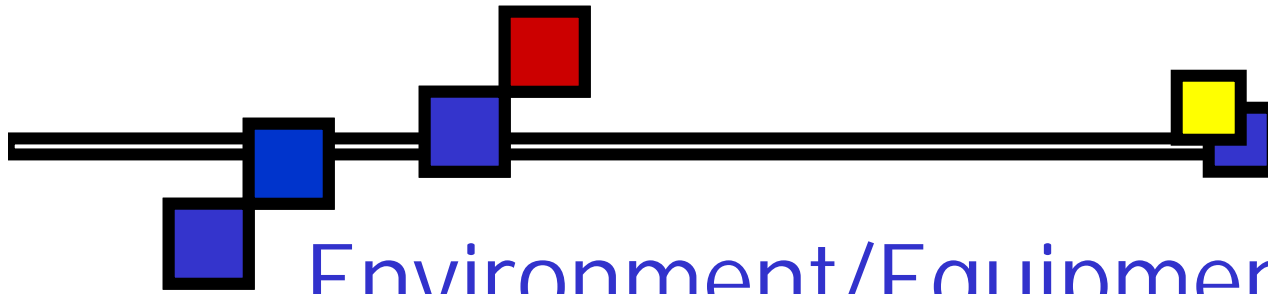


Fatigue/Scheduling Questions Examples

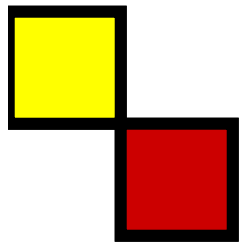


- Was the environment free of distractions?
- Was there sufficient staff on-hand for the workload?

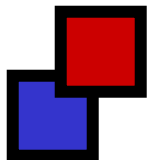


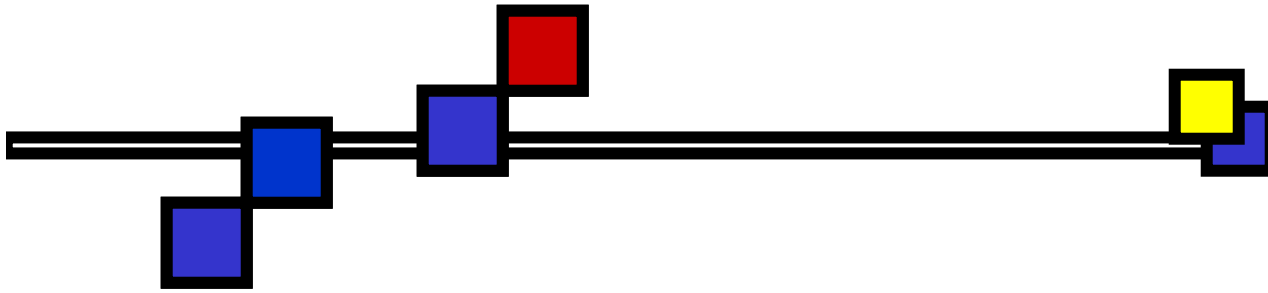


Environment/Equipment Questions Examples

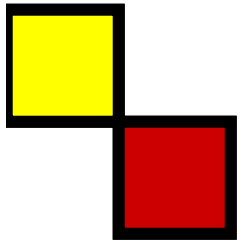


- Was the work area/environment designed to support the function for which it was being used?
- Was equipment designed to properly accomplish its intended purpose?

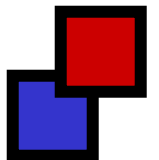


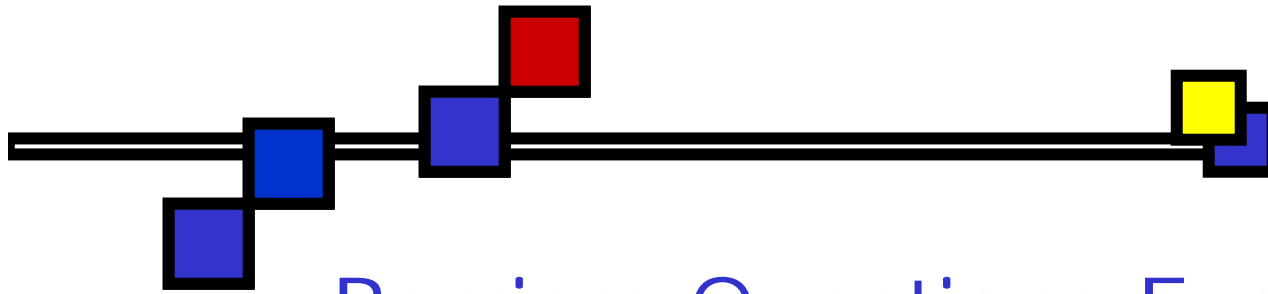


Rules/Policy/Procedures Questions

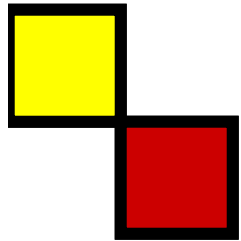


- Were policies in place and up-to-date?
- Did management have an audit or quality control system to inform them how key processes related to the adverse event are functioning?

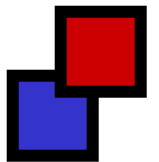


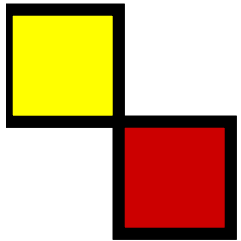
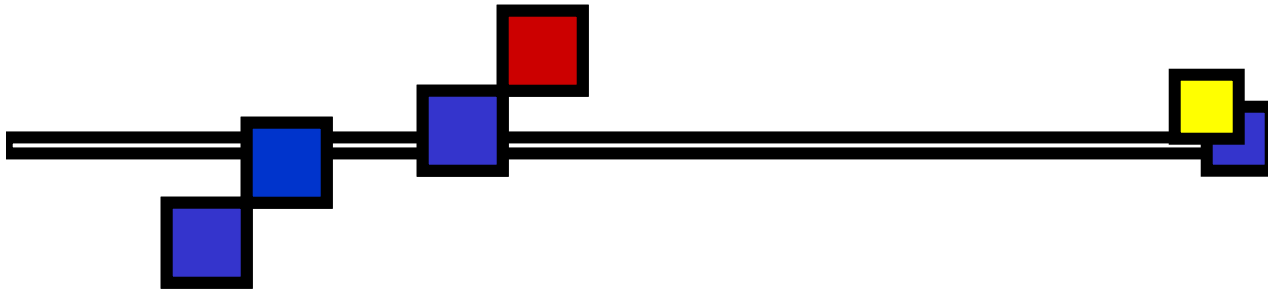


Barriers Questions Examples



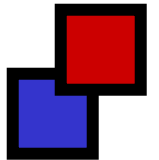
- What barriers and controls were involved in this adverse event or close call?
- Were these barriers and controls in place before the event happened?

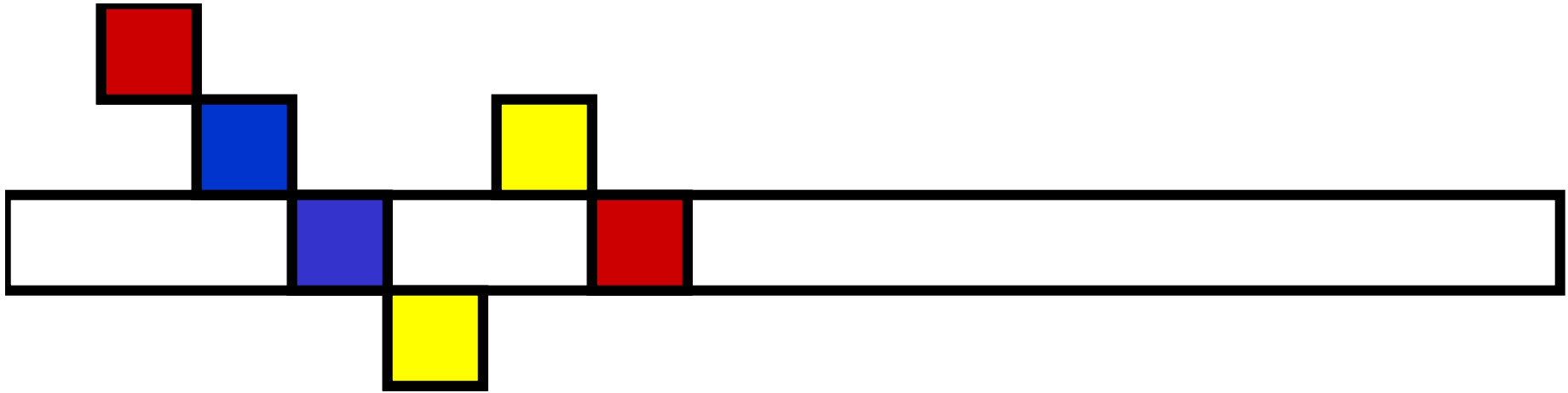




The full VA Patient Safety Triggering & Triage Questions™ are available @

- <http://www.patientsafety.gov/tools.html>





Tools Used to Compile Data



Human Factors Table from an RCA

Item #	Root Causes/Contributing Factors	Human Factors Categories & Questions by Number					
		HF-C	HF-T	HF-F/S	HF-E	HF-R	HF-B
1.	BCMA "workarounds" increase the likelihood of medication errors.			6		13	
2.	BCMA laptops transmission drops off increasing probability of workarounds				13		
3.	Long delays for pharmacy review of now orders increase the probability of a workaround and an error	7, 12					

HF-C = Human Factor Communication

HF-T = Human Factor Training

HF-F/S = Human Factor Fatigue/Scheduling

HF-E = Human Factor Environment/Equipment

HF-R = Human Factor Rules/Policies

HF-B = Human Factor Barriers

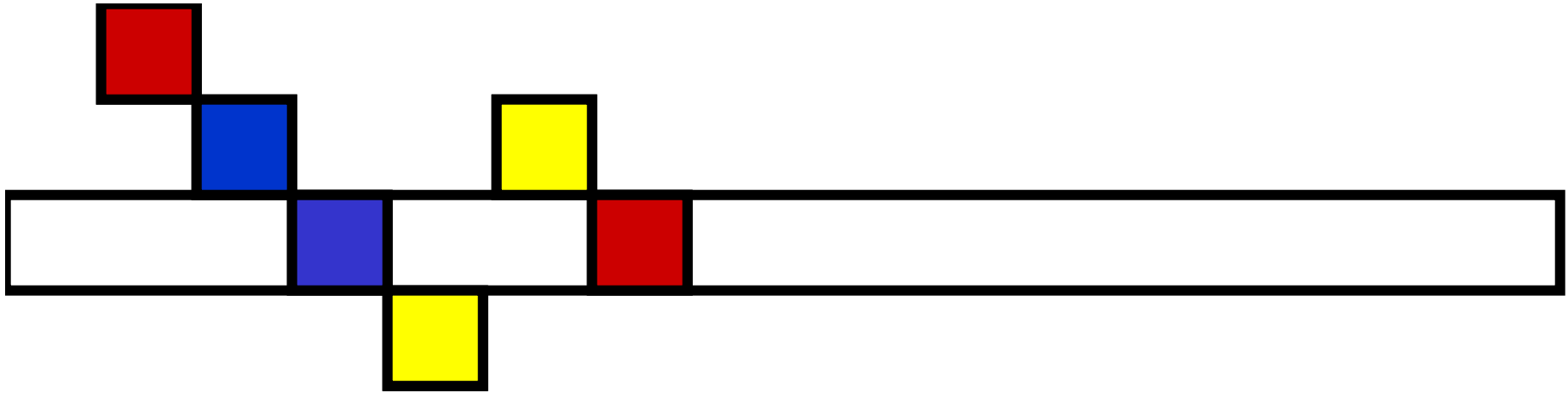
Cases Tally Sheet – Excel Document

Case #	Type	HF-Communication Factors Question Numbers													
		1	2	3	4	5	6	7	8	9	10	11	12	13	14
MA001	Fall		1	1											1
PH024	Med				1	1	1								
DL009	Elope								1				1		

Mark "1" each time question number was cited in the root cause

Human Factors Tally by Event Category & Total

Incident Types	HF-Training Factors Summary Question Numbers							
	1	2	3	4	5	6	7	8
Falls	0	0	0	1	0	2	1	0
Meds	10	9	10	6	5	4	9	5
Elopes	1	0	0	2	1	1	1	2
P-SUI	6	3	5	5	5	4	2	2
D-TX	12	14	10	16	10	9	11	4
Equip	17	14	8	17	16	7	18	9
Other	9	8	7	15	16	7	8	3
Total	55	44	40	62	53	34	50	25



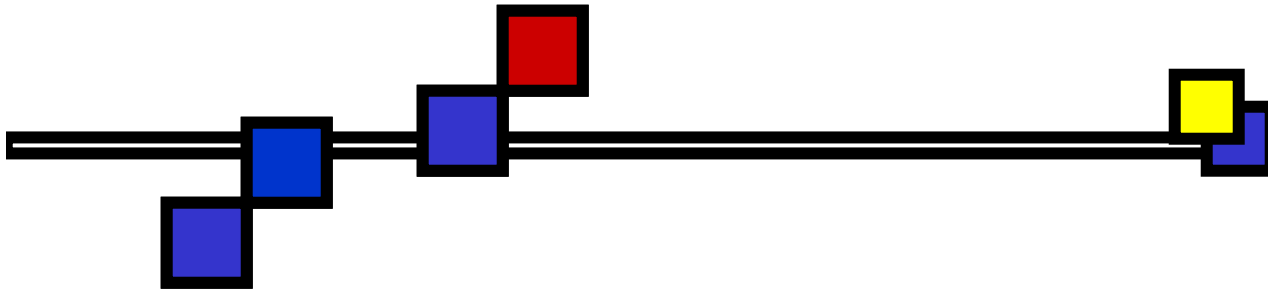
Findings & Analysis



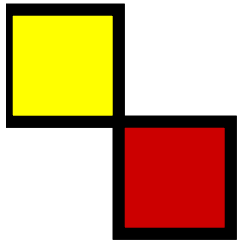
Across all event categories & by individual
event category

Across All Events

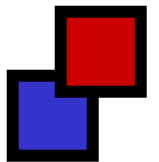
Category	Top 20% Human Factors by Category	%
Human Factors Communication	Information on assessments not shared/used	3%
	Communication between front line not adequate	3%
Human Factors Training	No program to identify what was needed for staff	2%
	Training not adequate	3%
Human Factors Fatigue/Scheduling	Environment not free of distractions	1%
Human Factors Environment/ Equipment	Work area not designed to support work function	2%
	No environmental risk assessment done	1%
Human Factors Rules/Policies/ Procedures	No overall management plan for risk	2%
	Policies on work processes not present or not up-to-date	4%
Human Factors Barriers	Barriers & controls contributed to the event	2%
	Barriers not designed to protect patient	2%



Too broad...

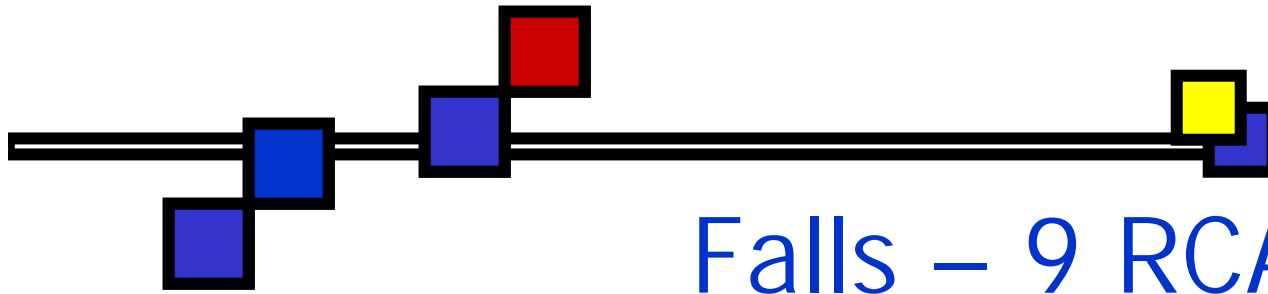


- Hard to pull out effective strategies
- Need to refine analysis by event categories



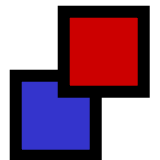
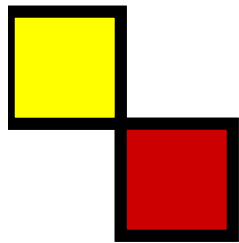
Category	Top Human Factors by Event - Falls	*%
Human Factors Communication	Correct technical information not communicated 24/7	9%
Human Factors Training	Policies/Equipment not reviewed to ensure a good fit with people & tasks	3%
Human Factors Fatigue/Scheduling	Not sufficient staff for workload	5%
Human Factors Environment/ Equipment	Work area not designed to support work function	3%
Human Factors Rules/Policies/ Procedures	Policies on work processes not present or not up-to-date	9%
Human Factors Barriers	Barriers & controls contributed to the event	3%
	Barriers not designed to protect patient	3%

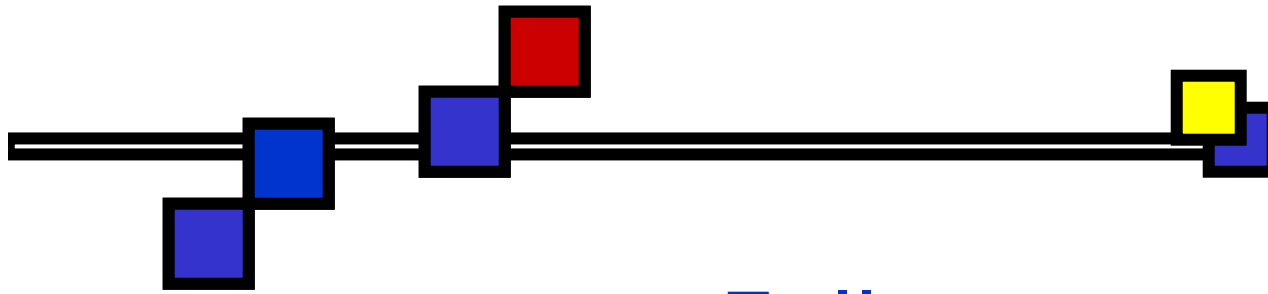
* Percentage of this event category only



Falls – 9 RCAs

- 9% policies/work process not present or up-to-date:
 - No consistent process for where to document high-risk patients
 - No consistent process of how to communicate fall risk to others
 - Shift-to-shift
 - When transporting to places like radiology
 - Across disciplines
 - No consistent actions for high-risk patients





Falls – continued

- 9% Technical information not communicated 24/7:
 - Directly related to communication of fall risk & interventions taken to prevent falls
 - No consistent process in place to communicate the information

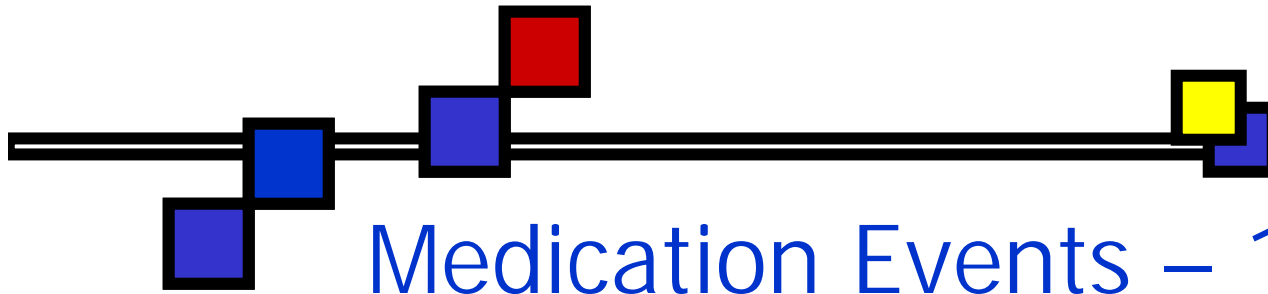
Category	Top Human Factors by Event - Meds	*%
Human Factors Communication	Communication between front line members not adequate	3%
	Communication between management and front line not adequate	3%
	Existing documentation did not provide a clear picture of treatment plan	3%
	Policies not communicated adequately	3%
Human Factors Training	No program to identify what was need for staff	3%
	Results of training not monitored over time	3%

12%

6%

32

Category	Top Human Factors by Event – Meds (continued)	*%
Human Factors Fatigue/Scheduling	Environment not free of distractions	2%
Human Factors Environment/ Equipment	Work stress levels not appropriate	2%
	Equipment not designed to prevent mistakes	1%
Human Factors Rules/Policies/ Procedures	Policies on work processes not present or not up-to-date	4%
Human Factors Barriers	Barriers & controls contributed to the event	2%
	Barriers not designed to protect patient	2%
	Barriers in place not evaluated for reliability	2%



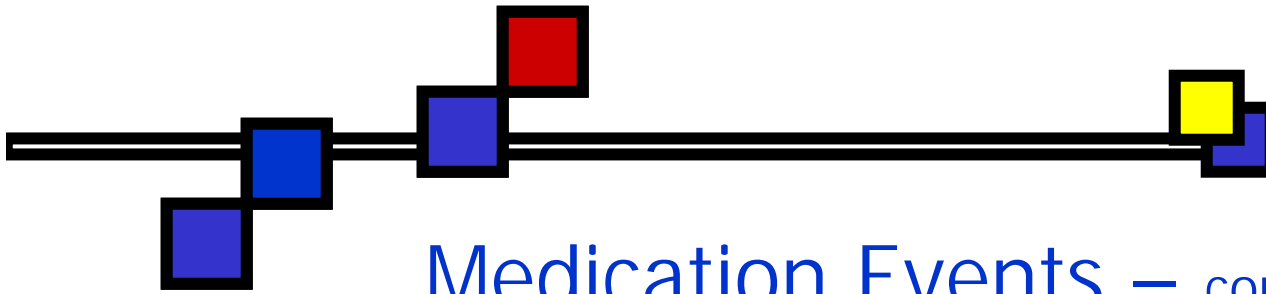
Medication Events – 14 RCAs

- 4% policies/work process not present or up-to-date:

- Generally related to Bar-Code Medication Administration (BCMA)

- No plan for what to do if:

- Scanner doesn't scan (unreadable ID bands & meds)
- Batteries in BCMA laptop fail
- Dead-spaces encountered in wireless transmission (freezes)
- How to handle stat orders (time-lapse duplication)
- Missing bar-codes (on medications, on patients)



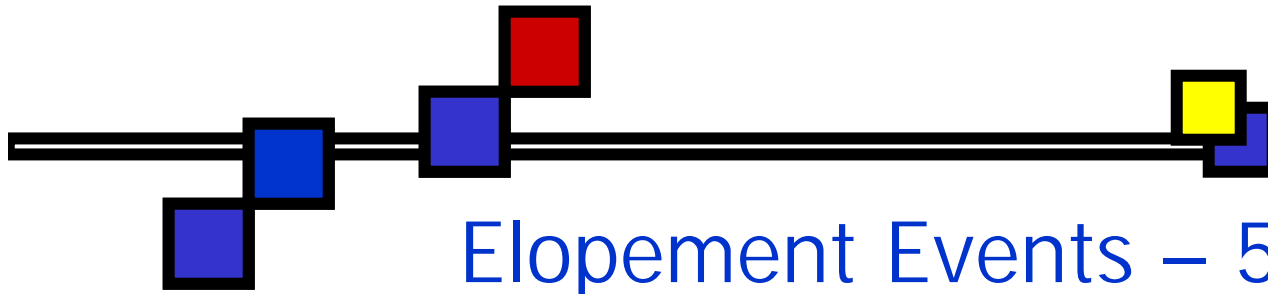
Medication Events – continued

- 12% split between 4 communication factors
- The 6% training factors strongly related to communication

- Electronic communication in BCMA was:

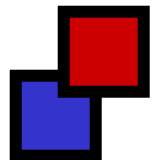
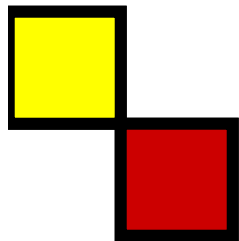
- Difficult to see or staff didn't know where to look
- Delayed in appearing
 - Nurse processes order before Pharmacist identifies a conflict
- Not monitored well as BCMA evolved to assess if staff found updates to the system intuitive
- Absent in the beginning of BCMA use due to initially using both BCMA & a paper record
 - Information would appear in one medium & not the other


Category	Top Human Factors by Event - Elopes	*%
Human Factors Communication	Policies not communicated adequately	6%
	Patient not correctly identified	6%
Human Factors Training	Training not adequate	6%
	Equipment did not work smoothly	6%
Human Factors Fatigue/Scheduling	All single HF citations	0
Human Factors Environment/ Equipment	Work area not designed to support work function	8%
Human Factors Rules/Policies/ Procedures	Policies on work processes not present or not up-to-date	5%
Human Factors Barriers	Patient risk not considered in design of barrier	3%
	Barriers not evaluated for reliability	3%




Elopement Events – 5 RCAs

- 8% Work area not designed to support work function
 - Related to alarm systems function
 - Appropriate settings
 - Ability to thwart system (shielding by patient, sub-optimal sensor placement)
- 5% policies/work process not present or up-to-date:
 - Related to:
 - Who searches for patient
 - When & how search is conducted
 - Who else is notified & by whom



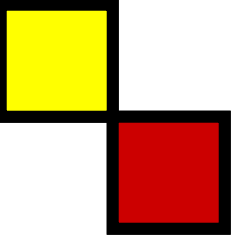
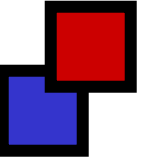


Category	Top Human Factors by Event – P-SUI	*%
Human Factors Communication	Information on assessments not shared/used	7%
Human Factors Training	No program to identify what was needed for staff	3%
Human Factors Fatigue/Scheduling	Not sufficient staff for work load	1%
Human Factors Environment/ Equipment	All single HF citations	0
Human Factors Rules/Policies/ Procedures	Policies on work processes not present or not up-to-date	5%
	No overall management plan for risk	5%
Human Factors Barriers	Barriers not designed to protect patient	2%

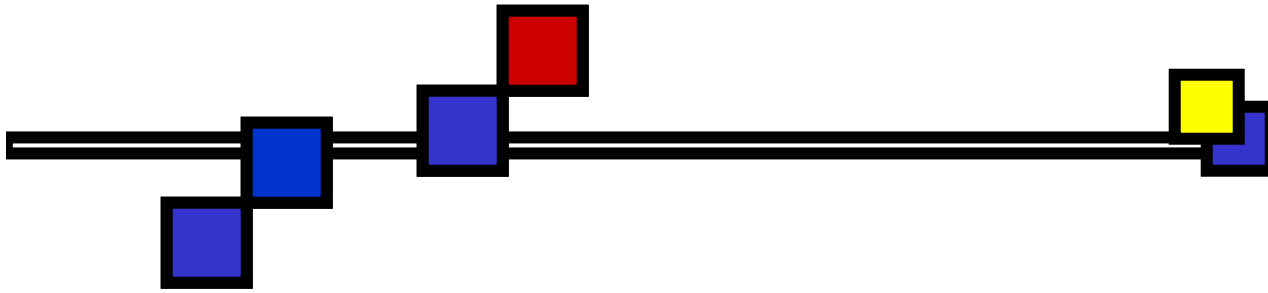




Para-Suicide Events – 14 RCAs

- 
- 7% information on assessments not shared
 - Primarily risk assessments between clinicians
 - 5% policies/work process not present or not up-to-date:
 - Related to no consistent guideline on how risk is documented
- 


Category	Top Human Factors by Event – D-TX	*%
Human Factors Communication	Communication between front line staff not adequate	3%
	Communication of risk factors not free of obstacles	3%
Human Factors Training	Training not adequate	3%
	Training not provided prior to the start of work	2%
Human Factors Fatigue/Scheduling	Environment not free of distractions	1%
Human Factors Environment/ Equipment	Work area not designed to support work function	1%
	No environmental risk assessment done	1%
Human Factors Rules/Policies/ Procedures	Policies on work processes not present or not up-to-date	2%
	Previous audit of process not done or interventions not timely	2%
Human Factors Barriers	Management had not method for identifying potential results of change prior to implementation	2%




Delayed Treatment – 17 RCAs

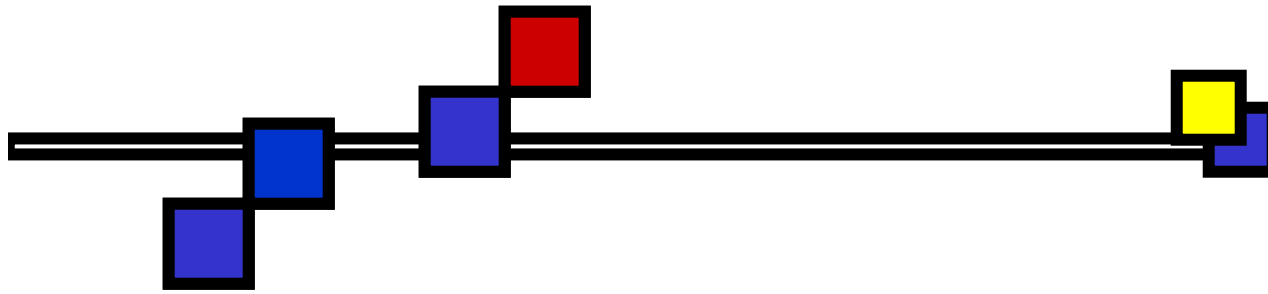
- Wide variance in events
 - Anything from delayed blood tests to facility-to-facility transfers
- One common factor
 - Communication, training & policy gaps were related to the “hand-off” of the patient

Category	Top Human Factors by Event – Equip	*%
Human Factors Communication	Communication of risk factors not free of obstacles	3%
	Information on assessments not shared/used	3%
	Inadequate communication between management & front line	3%
Human Factors Training	No program to identify what was needed for staff	3%
	Training not adequate	3%
	Not all staff trained in use of relevant controls	4%
Human Factors Fatigue/Scheduling	Personnel did not have adequate sleep	1%
	Fatigue not properly anticipated	1%



Category	Top Human Factors by Event – Equip (continued)	*%
Human Factors Environment/ Equipment	Work area not designed to support work function	2%
	No environmental risk assessment done	2%
Human Factors Rules/Policies/ Procedures	Policies on work processes not present or not up-to-date	3%
	Staff involved with adverse event not qualified to perform their functions	3%
Human Factors Barriers	Barriers not designed to protect patient	2%

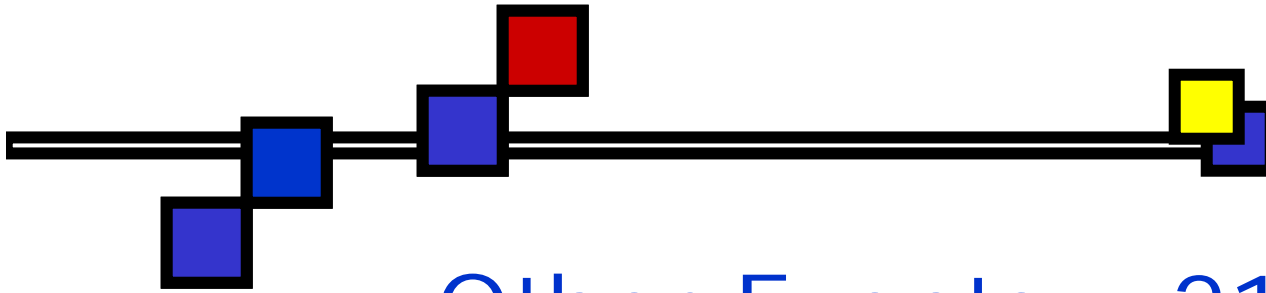




Equipment Events – 18 RCAs

- 4% staff not trained in use of relevant controls
 - Some controls were thought to be so intuitive, they weren't taught (example: color-coded "Christmas trees" for gas outlets)
- 3% policies/work process not present or not up-to-date:
 - Most related to when & how equipment checks are performed or equipment set-up

Category	Top Human Factors by Event – Other	*%
Human Factors Communication	Communication between front line staff not adequate	3%
	Existing documentation did not provide a clear picture of treatment plan	3%
Human Factors Training	Training not adequate	3%
	Training programs not designed with intent of helping staff perform tasks without error	3%
Human Factors Fatigue/Scheduling	Environment not free of distractions	2%
Human Factors Environment/ Equipment	Work area not designed to support work function	2%
	No environmental risk assessment done	2%
Human Factors Rules/Policies/ Procedures	Policies on work processes not present or not up-to-date	4%
	Previous audit of process not done or interventions not timely	3%
Human Factors Barriers	Barriers and controls contributed to adverse event	2%



Other Events – 21 RCAs

- Wide variance in events

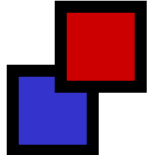
- Anything from delayed locks that have no keys to improper technique

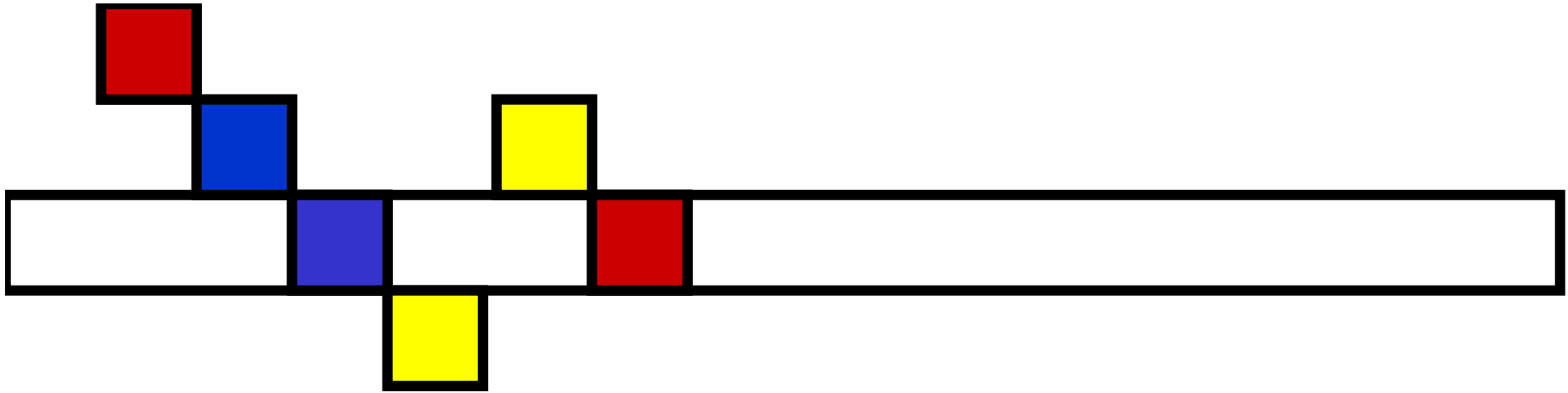
- One common factor:

- Work process gaps were related to lack of anticipating the sequence of events that occurred
 - Never thought someone would mistake an air outlet for an oxygen outlet just because both were in close proximity & hook-ups were of a similar color?



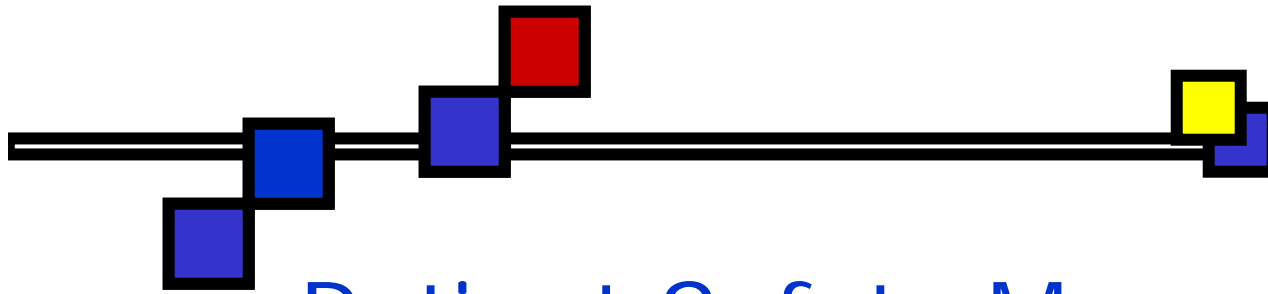
Validating Top Human Factors with Individual Patient Safety Managers

- In December 2003, the Patient Safety Managers were asked to assess the effectiveness of:
 - Actions related to the top 20% most frequently occurring human factors
 - Some of these actions were taken as far back as October 2000 (FY 2001 runs 10/00 to 09/01)
- 



Glitch!

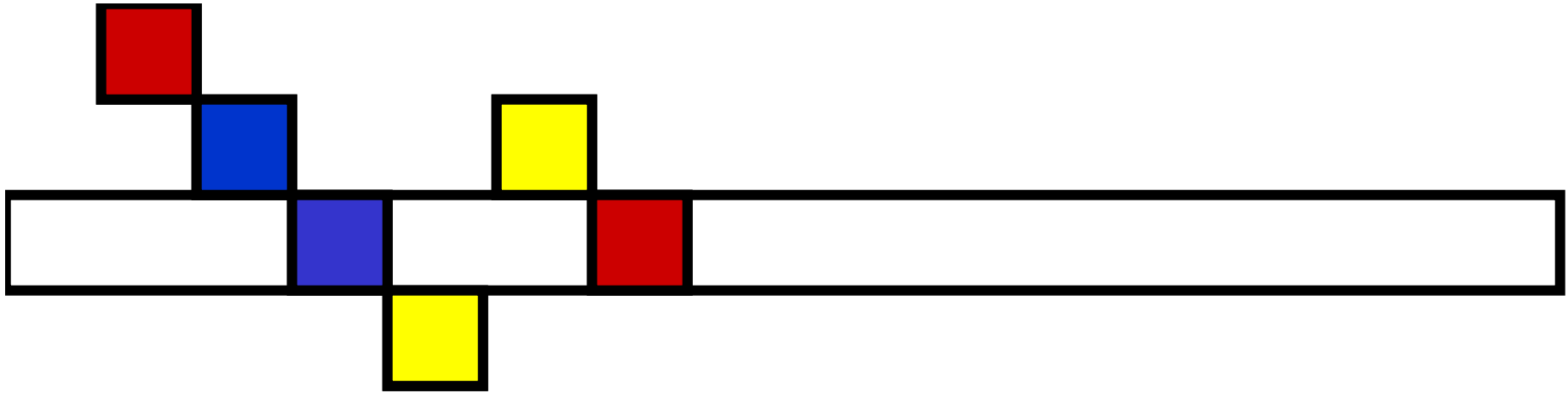




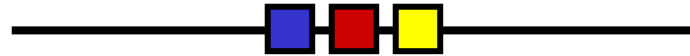
Patient Safety Managers

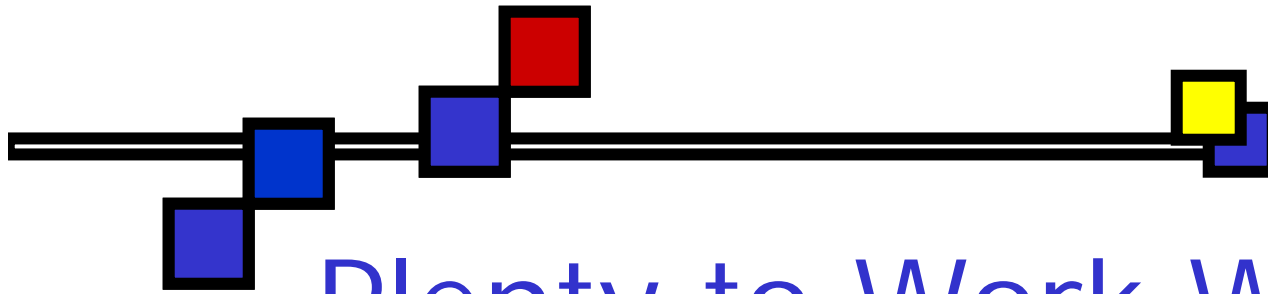
- Of the 6 Patient Safety Managers in the network:
 - 4 had changed roles in the years from 2001 to 2003
- Records were incomplete or not kept for part of this time resulting in:

Inability to assess success of implementation

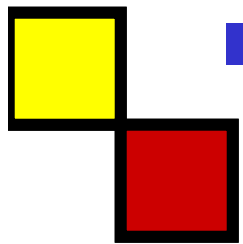


Recommendations



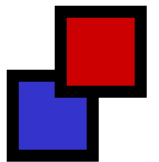


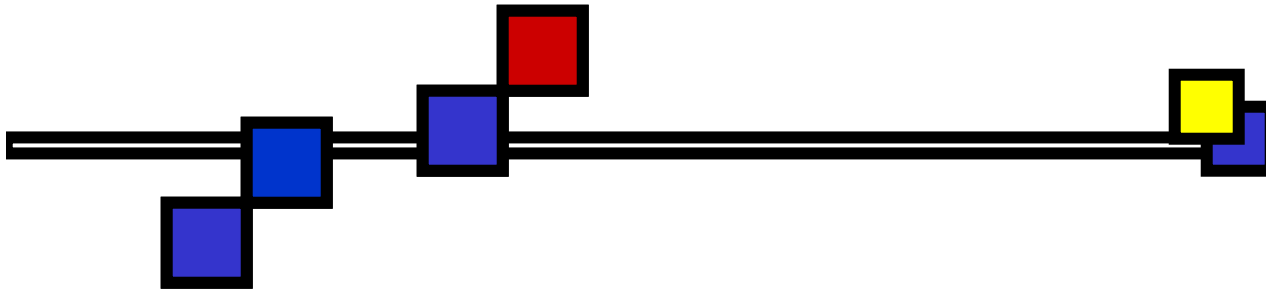
Plenty to Work With...



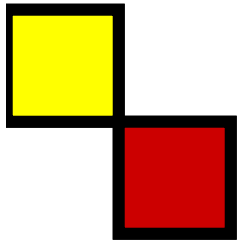
- Two recommendations chosen to start:

- 1) Let's decrease the reliance on memory and remove the single-point weakness of the losing historical information if the Patient Safety Manager changes jobs...

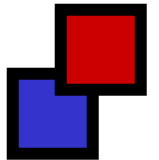




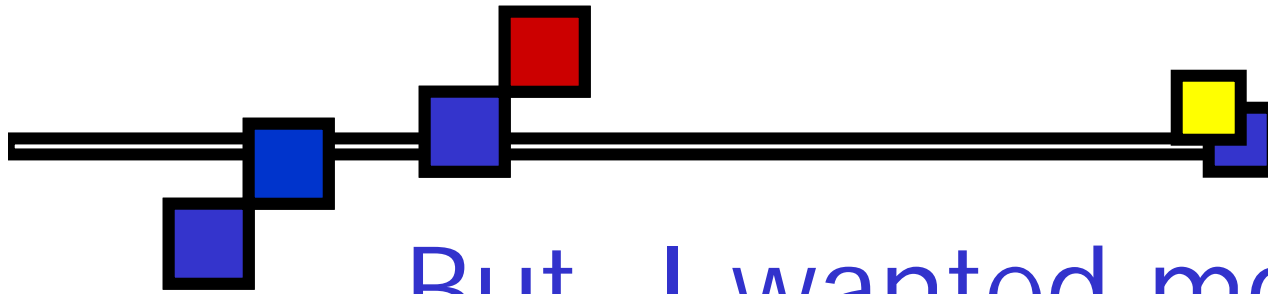
- Something already in the works,



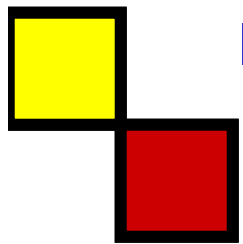
- In December 2003, VA National Center for Patient Safety (NCPS) introduced the ability to record successes next to the event in the national database



- *Patient Safety Managers are currently learning how to do this*

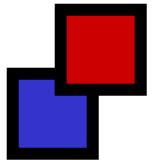


But, I wanted more!



- Entries are currently free-text
 - Wide-range of entry quality

- In March 2004, the VA National Center for Patient Safety was asked to consider adding:
 - One scale to rate fullness of implementation of the action
 - One scale to rate **effectiveness** of action

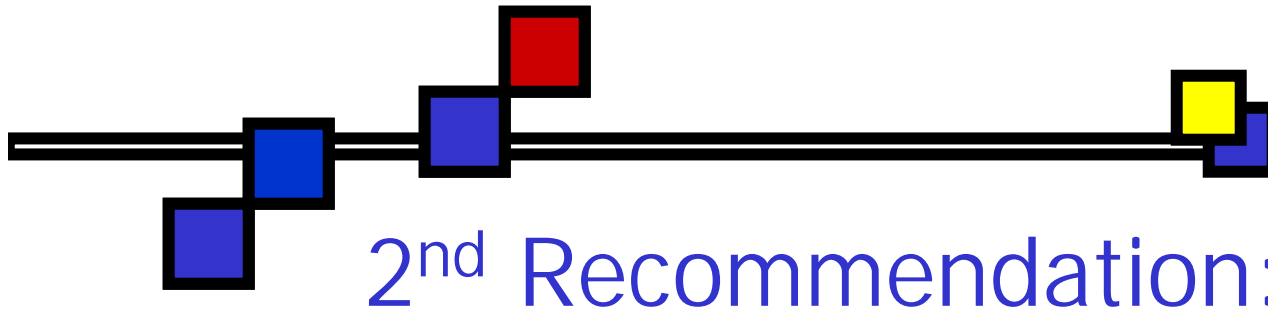


FORMAT NOW IN PLACE

Root Cause	Action	Outcome Measure
Construction workers disabled alarm permitting Pt to elope.	Daily environmental rounds during construction to ensure alarms are either on or doors are under observation.	100% of checks show either alarms on or door being observed.
Follow-up:	100% of rounds that were done showed compliance.	Recently added by NCPS
But, still can't tell if checks made every day or not		

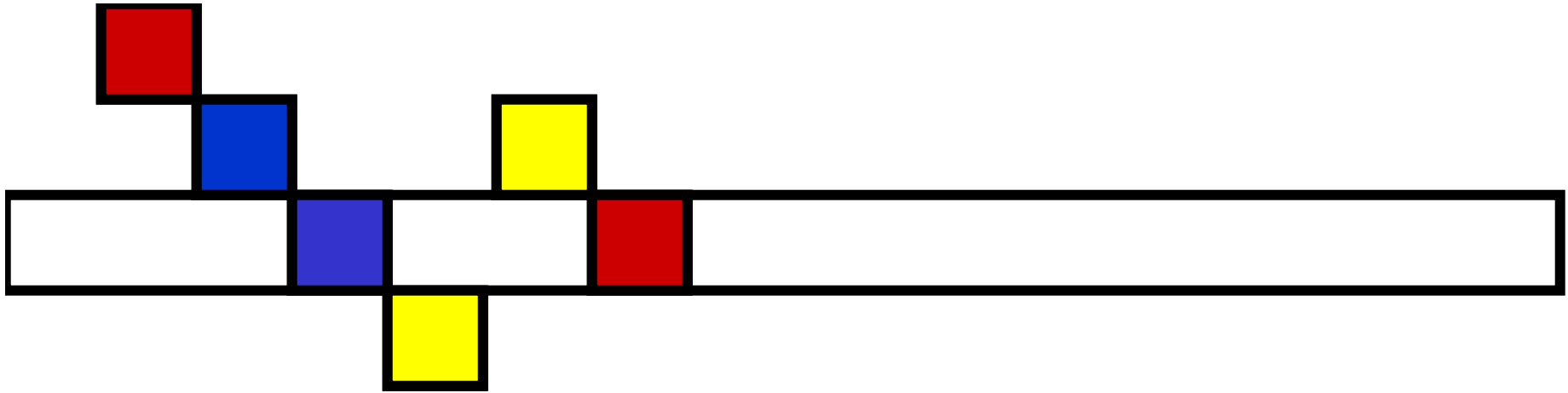
SUGGESTED FORMAT

Root Cause	Action	Outcome Measure
Construction workers disabled alarm permitting Pt to elope.	Daily environmental rounds during construction to ensure alarms are either on or doors are under observation.	100% of checks show either alarms on or door being observed.
Follow-up:	0 1 2 3 ----- ----- ----- Action Implemented 0=not at all 3=fully	
<i>Scale in addition to text</i>	0 1 2 3 ----- ----- ----- Action Successful 0=not at all 3=fully	



2nd Recommendation:

- Medication events related to no plan to correct systems breakdown
 - Team of pharmacists, nurses, engineers, IT, educators & safety staff
 - Gathering of network-wide inventory of breakdowns started in April 2004
 - Team to target each breakdown & build standardized guidance, communication & training across the network



~ ~ ~ THANK YOU! ~ ~ ~

