Designing Reliable Systems of Care

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Objectives

- Identify the reasons for poor reliability in current improvement efforts
- Articulate the design requirements for reliable process design
- Utilize the 3 step design methodology on a practical example

Framework for Reliable Design

- Reliability occurs by design not by accident
- Process is the action point of all improvement methodologies
- Segmentation allows the perfection of the design

Starting Labels of Reliability

- Chaotic process: Failure in greater than 20% of opportunities
- 80 to 90 %: 1 or 2 failures out of 10 opportunities
- 95% or better: 5 failures or less out of 100 opportunities

Reasons for the Reliability Gap in Health Care

- Current improvement methods in health care are highly dependent on vigilance and hard work
- The focus on benchmarked outcomes tends to exaggerate the reliability within healthcare, hence giving both clinicians and leadership a false sense of security
- Permissive clinical autonomy creates and allows wide performance margins
- The use of deliberate designs to achieve articulated reliability goals seldom occurs

The Reliability Design Strategy

- **"Set-up" for success**

- **Use the following three step method:**
  - Prevent initial failure using intent and standardization
  - Identify defects (using redundancy) and mitigate
  - Measure and then communicate learning from defects back into the design process

The "Set Up" for Reliability

- Select a topic whose outcome you want to improve
- Determine a high volume segment for initial design testing
- Build a high level flow chart for that segment
- Determine where the defects occur in the current system
- Determine where your design work will begin by identifying where the commonest defects occur
- Verbalize the reliability (hint: it is always 95% or better)

Why Segmentation is Helpful

- Allows for the control of some variables
- Defines the boundaries around which sequential expectations for success can be found
- More likely to test the validity of the design rather than deal with barriers
- Fosters a deeper understanding of the design complexity required for the project
- Forces understanding of the differences between segments as design strategies
- Allows the formation of more predictable timelines

Finding your First Segment

- The segment must represent a reasonable volume
- The segment should have clear cut defined boundaries
- The segment should have willing participants so the barrier of agreeing is not a problem
- The segment should allow for key articulated variables or barriers to be neutralized
- The first segment should establish a design theme

Segment for the Ventilator Care Bundle

- Patients in ICU-9
- Dr. Smith's patients
- Patients on the South side of the ICU
- Medical ICU with two willing doctors

Example: Ventilator Care Bundle "Set Up" Segment: Medical ICU With 2 Willing Doctors

Patient placed on ventilator	Elements of the bundle ordered	Elements of the bundle accomplished	Patient removed from ventilator

Of the elements of the bundle, the head of the bed elevation is most commonly not accomplished

Our aim achieve a 95% or better reliability at keeping the head of the bed elevated

Exercise

- Select a topic
- Select a segment
- Draw a high level flow diagram

Report Out Formula

- Identify the topic area whose processes you have chosen to make more reliable.
- Describe the segment on which you will test your design.
- Describe your high level flow chart (5 boxes max).
- In which box do most of your defects occur?
- State your reliability goal for the segment.

The Reliability Design Strategy

- Prevent initial failure using intent, simplification and standardization
- Identify defects (using redundancy) and mitigate
- Measure and then communicate learning from defects back into the design process

Why Standardize?

- Contribute to building an infrastructure (who does what, when, where, how and with what?)
- Support training and competency testing to sustain the process
- Achieve front line articulation of key processes by staff
- Allow the appropriate application of evidence-based medicine consistently
- Feedback about defects and application of learning to design is possible

Current Common Standardization Strategies

- Expert meetings design comprehensive protocol using EBM over months of meetings.
- The result of the expert meetings is a protocol considered by the team as a finished product.
- Changes to the protocol are infrequently tolerated.
- Standardized protocols are expected to be stand alone and the end of the design (one size fits all).
- Compliance strategy is Level 1(Vigilance and hard work).
- No expectations form leadership regarding reliability of the standardization process.

New Standardization Concepts

- Standardize to provide the appropriate infrastructure (the how, what, where, who and when.)
- The “what” we are standardizing is based on medical evidence.
- The “how” does not need medical evidence but rather systems knowledge.
- Initial standardized protocols are developed with small time investment by experts tested at a very small scale.
- Changes to the protocol in the initial stages should be required and encouraged.
- Defects are studied and used to redesign the process.

Example: Ventilator Care Bundle – Head of Bed Elevation

- Who: Nurse caring for the patient
- What: Measure the head of the bed elevation
- With What: Tool at side of bed
- When: Every two hours when checking VS
- Where: At the bedside
- How: Read degree elevation at bedside monitor and adjust if needed

Your Turn – Using the Process You Selected Earlier:

- Describe the process you will standardize.
- Reconfirm the segment where the design will be first tested.
- Take at least a part of the process you want to make reliable and describe the who, what, (with what), when, where and how.

Exercise

- Who:
- What:
- With What:
- When:
- Where:
- How:

Three Tier Design Strategy

- Prevent initial failure using intent and standardization
- **Identify and mitigate (Redundancy/contingency function)**
- Critical failure mode function (identify critical failures and then redesign)

Why the Step Is Needed

- Allows less than perfect design in the standardization step (we do not have to plan for every possible contingency)
- Anticipates and allows failure in the prevent failure (standardization function) step
- Allows a better balance of resource use (no need to spend months coming up with the perfect design)
- Fosters the atmosphere of mitigation and recovery

Characteristics of "Redundancy Tools"

- Redundancy: back-up plan, failsafe, etc.
- Require careful consideration since they do represent a form of "waste"
- Requires a good prevent failure step (standardization function) before implementing a redundancy
- Need to be truly independent
- Need to be used or will no longer function as a good filter
- Must follow with a mitigation strategy

Human Factor Concepts

Human Factors and Reliability Science:

(Designing sophisticated failure prevention, failure identification and mitigation)

- Decision aids and reminders built into the system
- Desired action the default (based on evidence)
- Redundant processes
- Use fixed current scheduling in design
- Take advantage of habits and patterns
- Standardization of process based on clear specification and articulation

Example: Ventilator Care Bundle – **Head of Bed Elevation: Redundancy**

- Elevation is checked by unit secretary every two hours. If not elevated, contact nurse.
- Elevation is checked by respiratory technician at each visit to patient. If not elevated, contact nurse.
- Measure: how many times does this task find that the HOB is not elevated?
- Who should be info?

Your Turn – Using the Process You Selected Earlier

- Design a redundancy (who, what, when, where and how) that might be tested after your standardization step has been tested and designed.

- Design a measurement for the redundancy step (how will you decide how often the redundancy step is used?)

Three Tier Design Strategy

- Prevent initial failure using intent and standardization
- Redundancy function (identify failure and mitigate)
- **Critical failure mode function (identify critical failures and then redesign)**

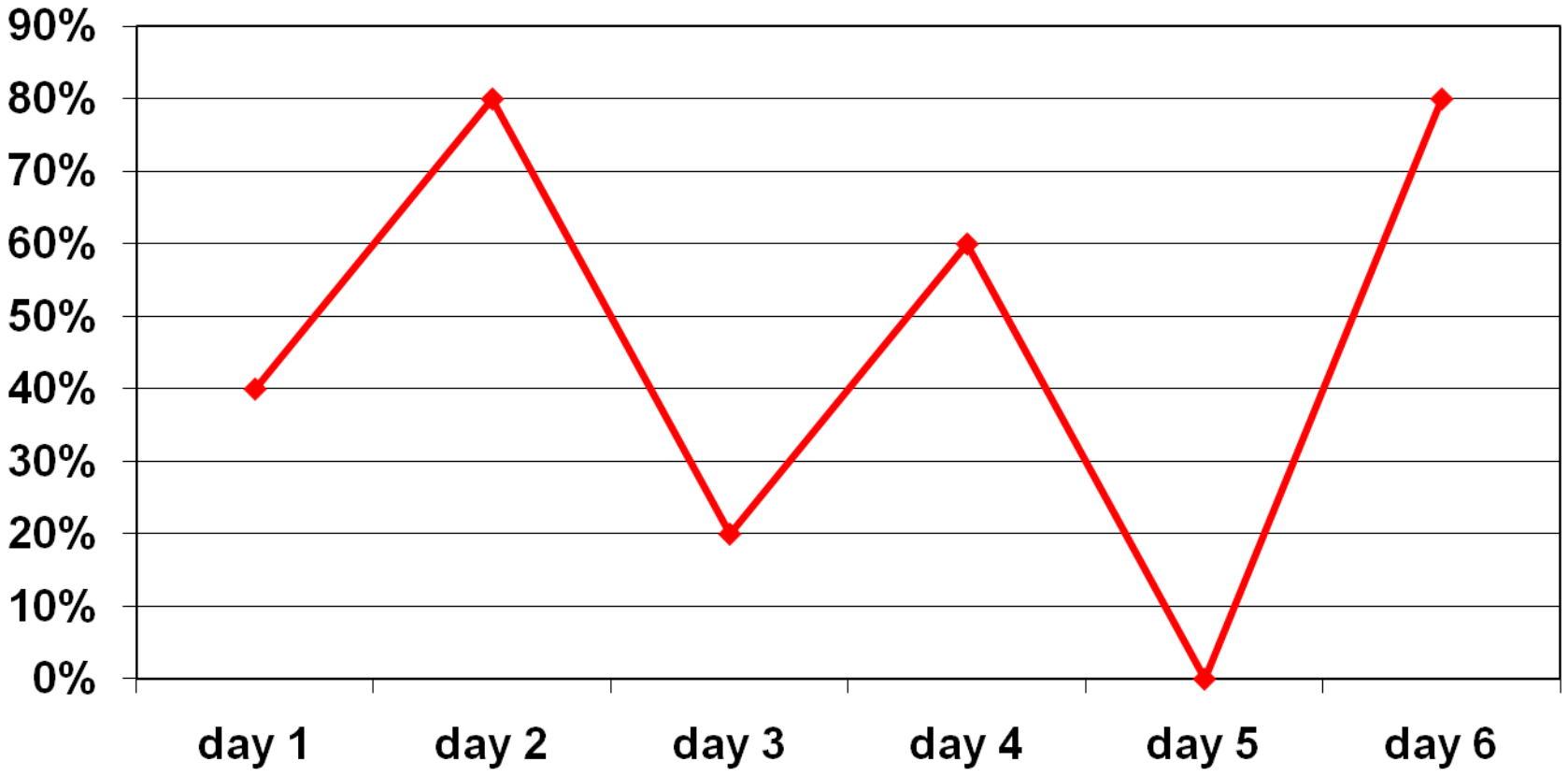
Critical Failure Mode Essentials

- A measurement of critical failure modes needs to be part of the initial design strategy
- Assess the defects that occur from the current design
- Should be prioritized in terms of overall affect on the reliability of the process change
- Should be used to redesign the process

Measurement

- Small samples over time should be use to determine if the process is improving.
- Data should be collected by the team with strict attention to the agreed upon tempo.
- Data should be collected for segments.
- Process measurements should be the primary team measures.
- Outcome measures are needed but do not need to be collected by the team.
- Outcome aims can be set at 0 or 100%, but your process aims should be 95% or better.

5 Charts/Day Run Chart



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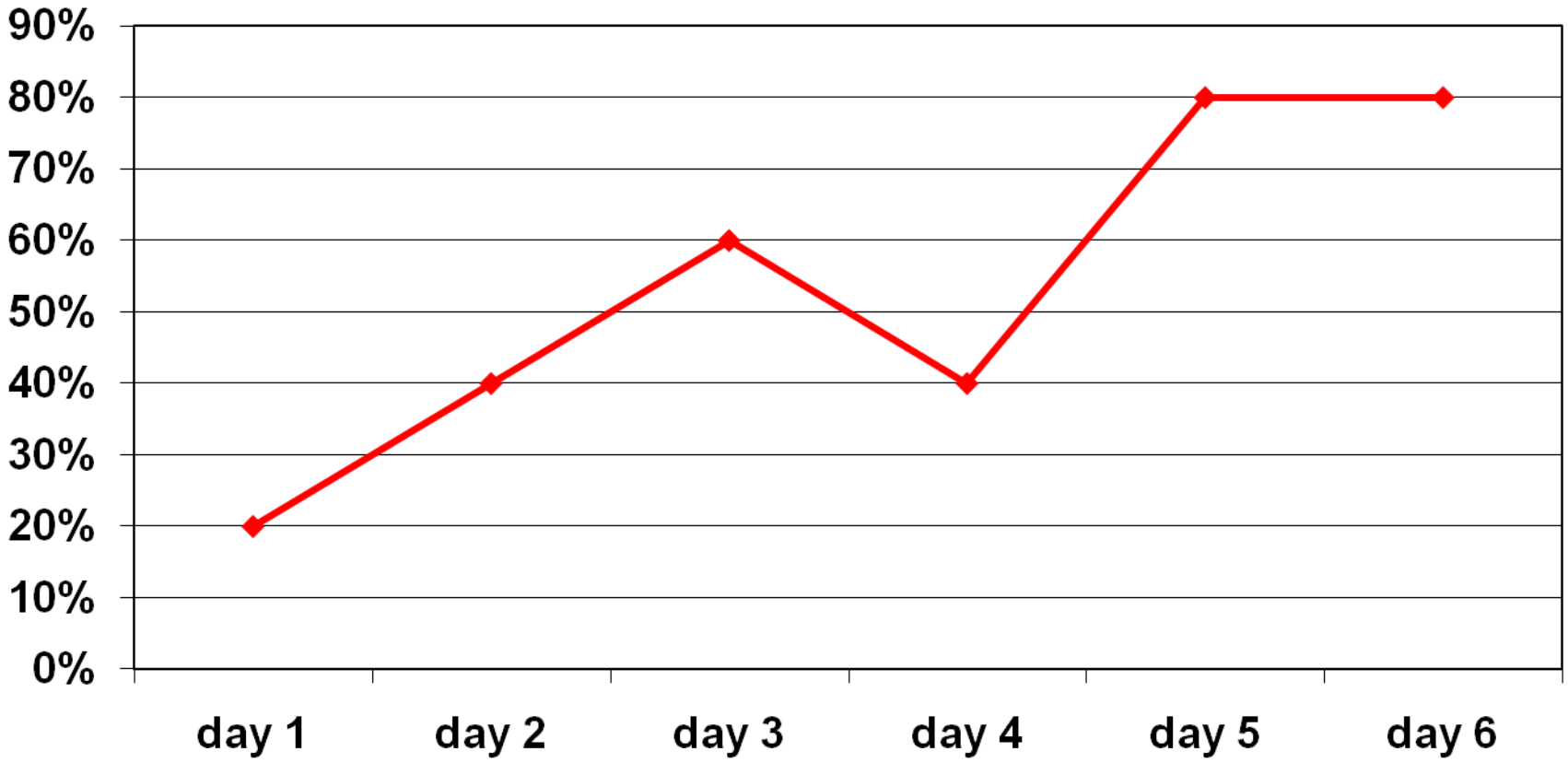


Example: Head of Bed Elevation: Critical Failure Mode Evaluation

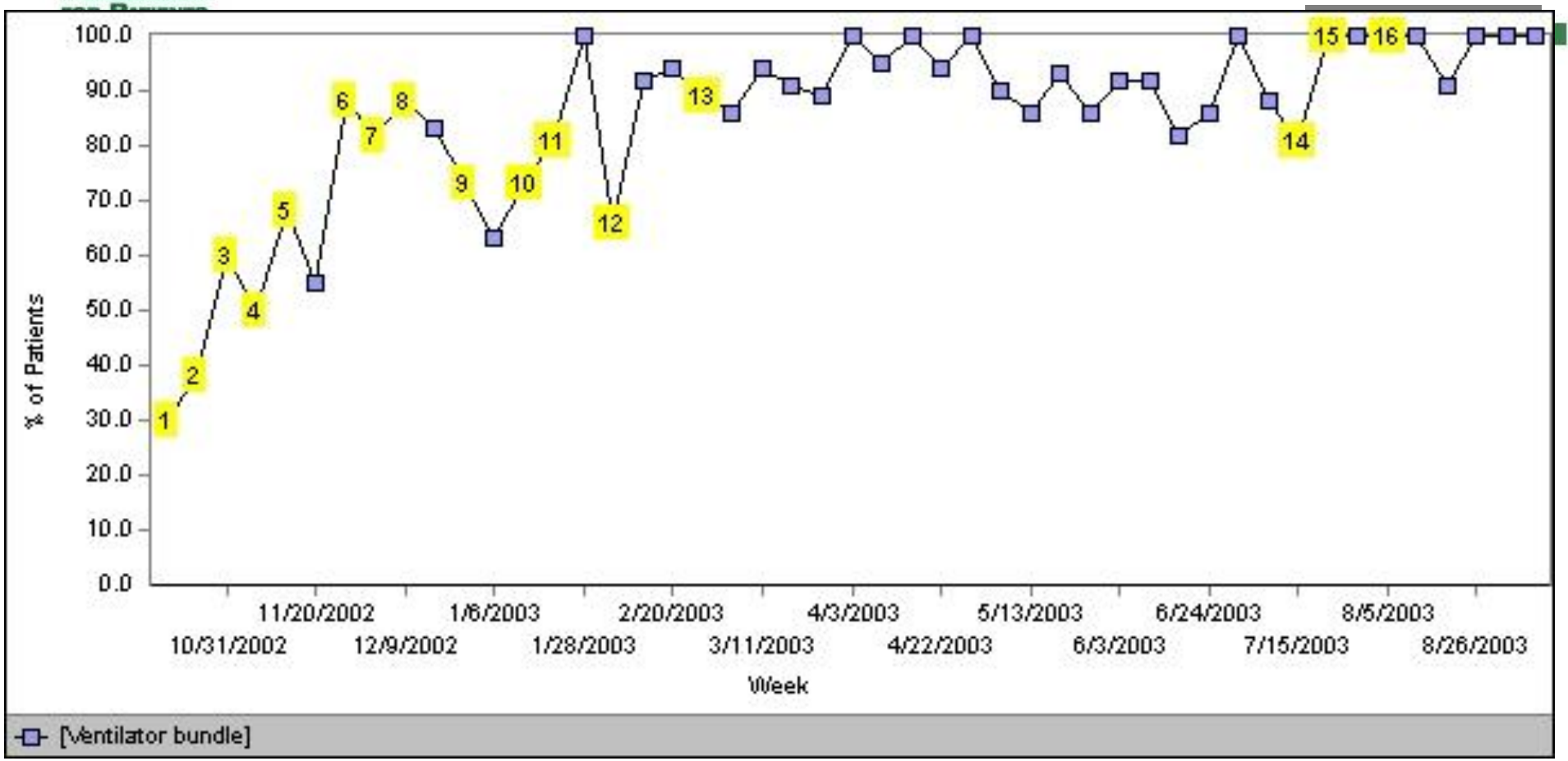
- Number of times that the head of the bed is not elevated and what time of day
  - Identified by nurse
- Number of times that the head of the bed is not elevated and what time of day
  - Identified by redundancy/contingency

Your Turn – Using the Process You Selected Earlier:

- Describe the process (who, what, when, where and how) you will be using to review defects.

- Describe your process (who, what, when where and how) to communicate the failures detected back to the design team.

Example of a Run Chart Showing Implementing the VAP Bundle



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Tempo of Change

- Dependent on frequency of data collection (one month interval data collection frequency of design change at best monthly)
- Dependent on rapid testing when new information suggests design changes
- Dependent on the timeline

Science and Outcomes

- Process reliability is linked to outcomes by science.
- If the process is “reliable” and the outcome is not achieved either the science is wrong or the process really is not being done correctly.
- Outcomes are linked to the processes by the confirmation the hypothesis.

Rules of Engagement

- Clearly outlines what is expected of teams and leadership in improvement work
- Allows the realistic setting of goals and timelines
- Permits negotiation for the right “contract”
- Elevates the improvement work to business level relationship

What Teams Should Expect from Leadership

- Clearly describe the organizational outcome goals (VAP, CLI, Mortality, etc.)
- Understand the relationship between the processes the teams are working on and the outcome goals of the organization
- Set process expectations for the teams (all elements of the VAP bundle will be done 95% of the time on eligible patients)
- Demand data to show how reliable the process has become
- Setting reasonable timelines
- If outcomes have not improved and process reliability is high, provide resources to determine the “correctness of performance” of the processes

What Leaders Should Expect of Teams in Health Care Reliability

- Initial focus of work should be on "getting the process right" with a known connection to an outcome
- Taking a set of processes to a agreed upon level of reliability within a specified timeline
- Teams will use reliability design principles in improvement work, not just hard work and vigilance
- Teams will develop good designs by using rapid cycle small tests of change

Identification of the Other Segments

- The total number of segments for a topic should not exceed 4-5.
- Segments should follow some theme in design (route of admission, type of clinician, etc.)
- Segments should differ by a distinct design feature.
- The initial division of segments can be adjusted as the design is developed.
- The segments should cover the population involved in the topic.

Key Questions To Analyze Testing and Implementation

Key Question	Your Evaluation
Is the connection between goals and process clear?	
Is the design strategy primarily vigilance and hard work?	
Has some degree of segmentation been used to test the design?	
Is standard work with testing been part of the design?	
Is a design methodology being used?	
Are small tests of change being used in a rapid cycle?	
Is data collection rapid enough?	

Key Questions To Analyze Spread

Key Question	Your Evaluation
Have you repeated the small test cycles as you spread from the initial site?	
Is the process of spread dependent on one person?	
Has some degree of segmentation been used to spread?	
Has customization been allowed or encouraged?	
Is the same team who developed the pilot now responsible for spread?	
Have you shifted your focus from process reliability to outcomes too early?	

Take a moment to reflect on the action plans you are creating.

What will you incorporate from this session into your action plan?