



THROUGH THE LENS OF LEAN HEALTHCARE MANAGEMENT

How an effective 15-minute morning huddle can set the pace of the whole day for your Clinical Engineering Team

Question(s)

- How many unscheduled service work orders does your team have open today?
- How many of those work orders are greater than one week old today?
- Do you know why those work orders are open today?
- ***We do and can give you a roadmap to get to this level of granularity and why it's important.***

Objective and Overview

- How Lean Management Applies to Service Organizations
- Historical Service Delivery Models
- Policy and Standard Work
- Theory into Practice
- Changing the Production Environment
- The Huddle and Production Board
- Leader and Technician Standard Work
- The Pay Off

Today's Presenters

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Supervisor, Clinical Engineering
WakeMed Health and Hospitals
Raleigh, NC



Point of Reference

- We are a 3 Hospital System
 - 1 Level I Trauma Center
 - 7 24x7 Emergency Departments
 - +50 Offsite Locations
 - +8500 Employees
 - 919 Total Beds
- 22 FTE Clinical Engineering Staff (Authorized)
 - 7 Dedicated Imaging Techs (1 Vacancy)
 - 13 Dedicated Biomed Techs (3 Vacancies)
 - 1 Road Warrior
 - 1 Director, 1 Supervisor, 2 Site Coordinators (Team Lead)
 - 4 Total Vacancies as of 12/28/17

Lean – What is it?

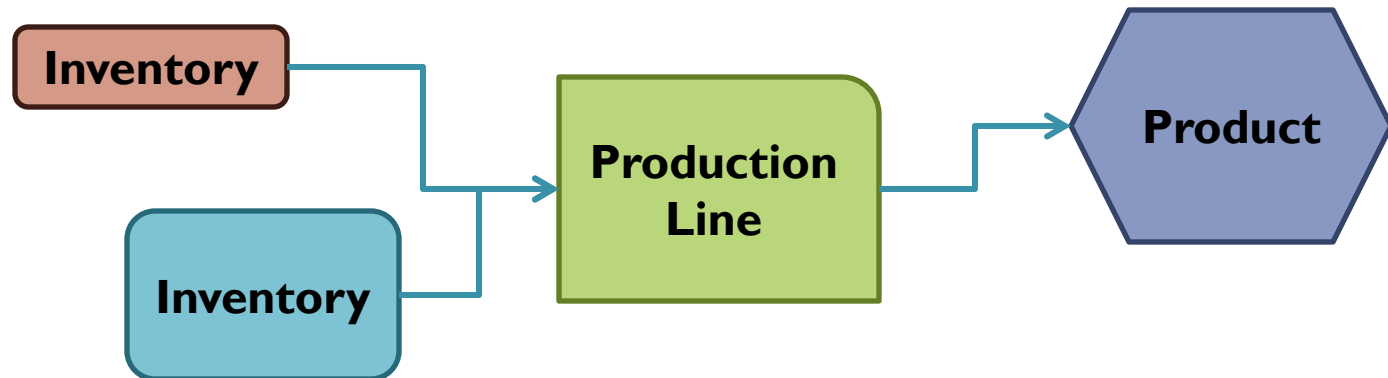
- 2 Elements
 - **Lean** – The increase of speed and efficiency through the reduction of waste
 - **6σ** – Continuous improvement in relation to customer requirements (Data, Reduction in Variation, Quality)
- Origin – Post WWII
 - Taiichi Ohno (Toyota Production System)
 - Elimination of Waste
 - Empowering of Employees
 - Improved Productivity

Typical Reactions to Implementing Lean Practices (by both leadership and technicians)

- ‘Flavor of the Month’
- It will never work...
- I don’t have time for that...
- My Leadership won’t Support It
- That’s not the way we do it here...
- We don’t need it...
- Etc.

Typical Application

- Originally envisioned for use in manufacturing/production environments.
 - Easily applied where both inventory and type of work can be controlled.



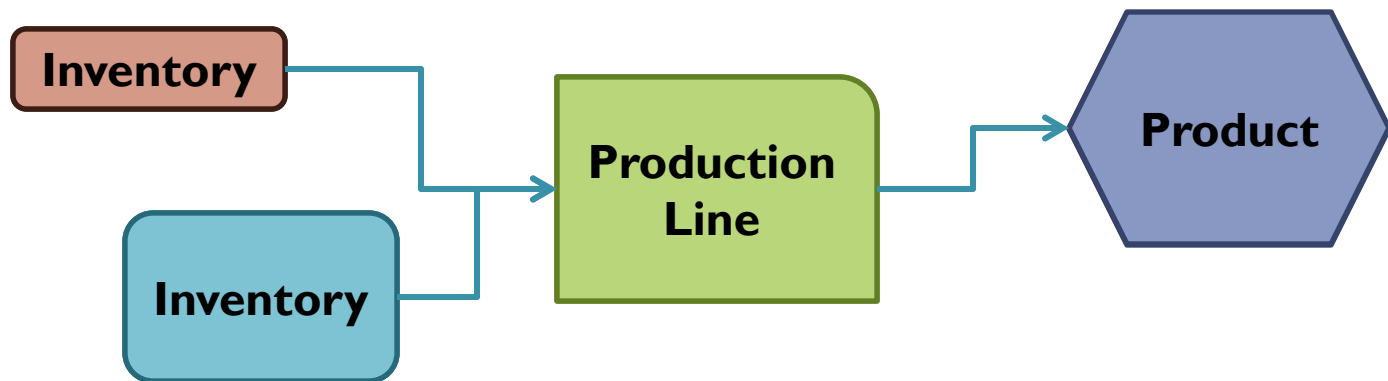
How does this apply to service?

- Is Clinical Engineering a 'Production' Environment?
 - Do we have a 'product'?
 - Do we pull from 'inventory' (not parts)?
 - Do we have a 'production line'?



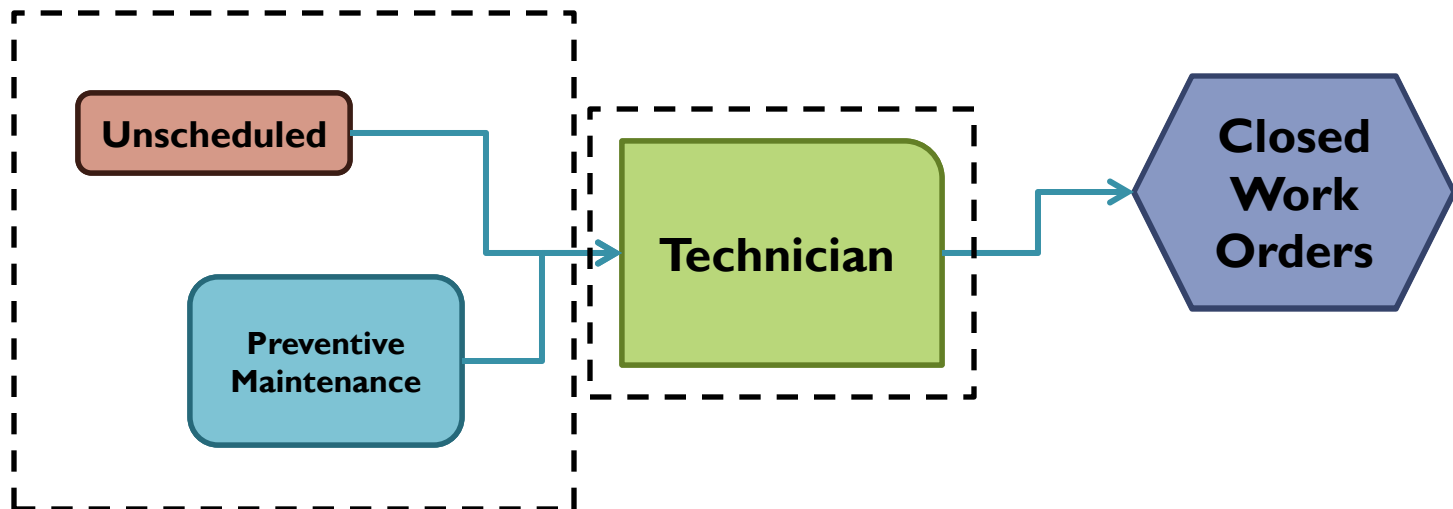
Production in Clinical Engineering

- What happens if we consider each **technician** a ‘production line’?
- What is the inventory that we use to supply them?
- What is the product?



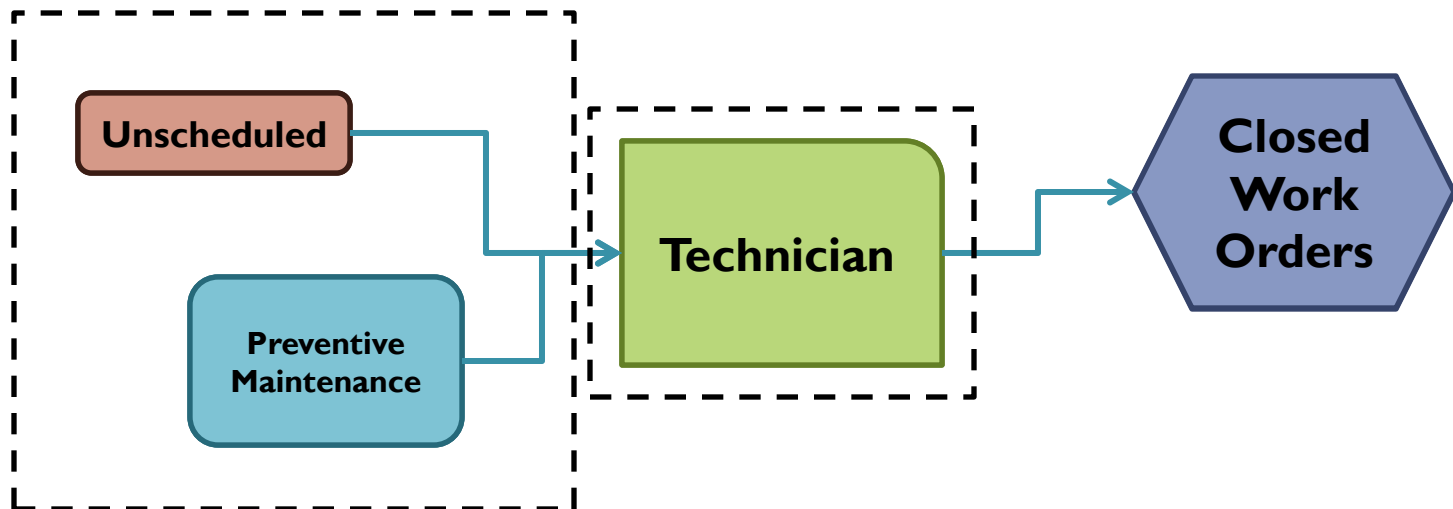
Clinical Engineering Production

- We are left with two problems to address:
 - Predictability of Incoming Work
 - Efficiency of the Production Line



Clinical Engineering Production

- What are the barriers that prevent functioning this way or, why would you want to?



Historical Delivery Models

- The **'Department'** Model
 - The hospital is broken into various sections, generally by department and assigned to technicians based on expertise, preference, bad luck, etc.



Pros

- Department Familiarization
- Customer Relationship
- Efficiency

Cons

- Lack of Depth
- Customer Relationship
- Inflexibility during absences
- Too Comfortable
- Work not captured
- Etc.

No control of incoming workflow due to unscheduled demand.

Historical Delivery Models

- **PM Crew/Unscheduled Crew**

- The workload is divided between a split shop, a portion works only PM's for a period of time, the other portion works unscheduled calls for the same period – then they switch.



Pros

- Efficiency
- Training Opportunities
- Can be good for new technicians

Cons

- Loss of training opportunities on unscheduled events
- Generally technicians can get miserable when stuck doing PM for a period of time.

Some control of incoming work (PM Crew Only).

Historical Delivery Models

- **“Jack of all Trades”**

- Technicians take what comes down the pipe, both scheduled and unscheduled.



Pros

- Variety is the spice of life...

Cons

- Form of controlled chaos
- No management oversight of what work is actually being done
- Usually evolves into breaking the hospital into device categories

No control of incoming work flow due to unscheduled demand.

Historical Delivery Models

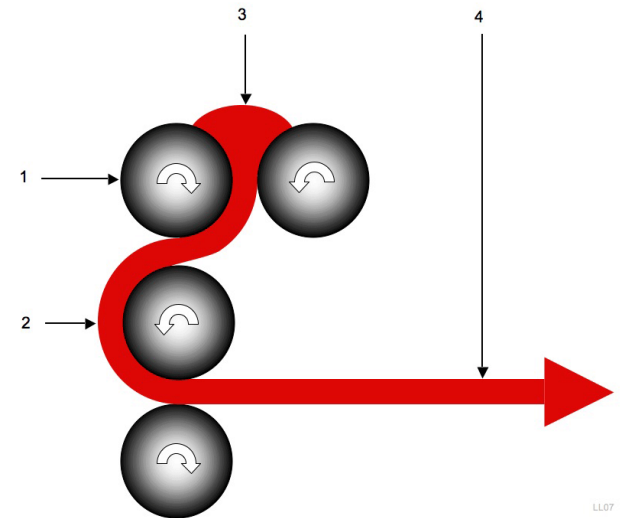
- Generally, none of these lend themselves to controlling the flow of incoming work, or reducing variation in process tasks.



- The first step in controlling flow is reducing variation in how tasks are performed through the use of process control and visual management.

Policy, Process and Standard Work

- Every activity performed on the production floor (the shop) should have a process (policy, procedure, flowchart, etc.) associated with it.
 - Parts Receiving
 - Alerts/Recalls
 - Incident Investigation
 - Initial Inspection/Surplus
 - Work Order Assignment
 - Preventive Maintenance



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Policy, Process and Standard Work

- Every technician should be familiar with:
 - What policies have been created
 - Where the policies are maintained
 - When to use a particular policy
 - What is the importance of using policies
 - What are the ramifications for not using a particular policy



Policy, Process and Standard Work

- Once you have established standard processes and begun to ensure individual adherence to policy:
 - You should see the time it takes to perform like tasks being to normalize
 - You can tweak individual policies for greater efficiency, resulting in greater collaborative gains
 - You can move on to Phase 2 - Establishing individual Standard Work processes



Policy, Process and Standard Work

- Standard Work

- Is a “Detailed **definition** of the most efficient method to produce a product (or perform a service) at a balanced flow to achieve a desired output rate. It breaks down the **work** into elements, which are sequenced, organized and repeatedly followed.” -

www.isixsigma.com/dictionary/standard-work/

- Can take many different forms such as:
 - Capacity Sheet
 - Combination Table
 - Work Chart
 - Checklist
 - Cycle Time Chart
 - Rounding Log



Policy, Process and Standard Work

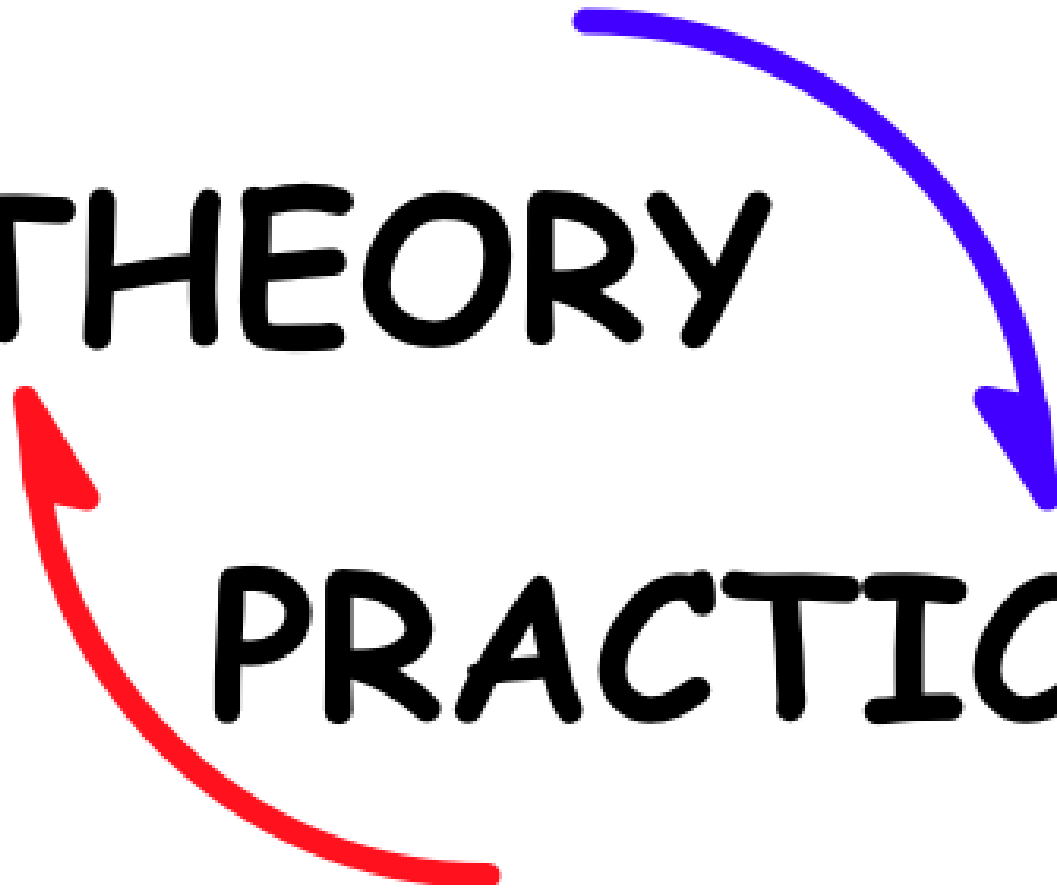
- Standard Work
 - Is best developed by those doing the work
 - Is only as detailed as it needs to be
 - Is frequently changed to reflect improvements in established process.



Practical Application

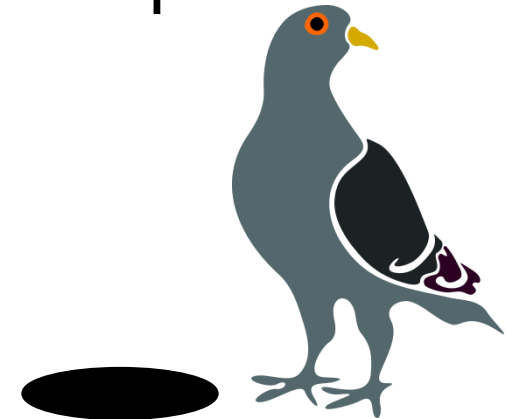
THEORY

PRACTICE



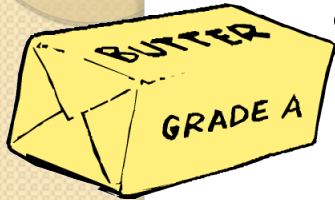
The New Model

- Everyone does Everything
 - (not as crazy as it sounds)
 - Increases training opportunities and depth in the shop
 - Encourages technical development and advancement
 - No one get's pigeon-holed into a particular modality



Scheduled Maintenance

- This is your bread and butter production ‘inventory’



- There is a known production quota given at the beginning of each month
- There is a known quantity of ‘production lines’ to distribute the work over
- The key is to divide the workload by **PM Hours**, not work order quantity – so you assign the same amount of labor hours to each technician – fair and equitable.



Scheduled Maintenance

- This is also the first piece of Standard Work that the technicians will be responsible for.
 - The production goal for PM's is established at 5% per work day – 25% per week – 100% per month. They are accountable to these numbers.
 - The total number of outstanding High Risk PM's is also monitored on a daily basis.



5

Scheduled Maintenance

- PM Parts are managed more efficiently
 - As we generate our PM's on the 15th of the previous month, the technicians know what PM's they have 2 weeks before they are due.
 - Each technician is required to pull their PM parts during this period to ensure that there will be no delays in completing a PM due to parts delays.
 - The result is that we no longer have any PM's delayed for parts other than vendor backorders.



Scheduled Maintenance

- Scheduled Maintenance Summary
 - Equal Distribution of Work Load
 - Constant Reporting of PM Work Load Progression
 - Constant Reporting of High Risk PM Progression
 - Reduction in PM delays due to Parts Unavailability
 - Technicians are very happy with this model as they have autonomy to run their business.



Unscheduled Maintenance



- Traditionally an Unknown Workload
- More Difficult to Manage due to Variability
- Most important factor to consider is that most unscheduled repairs are not critical outages and do not require a technician to drop what they are doing to attend to it.



Unscheduled Maintenance

- Critical Repairs – ***The Fireman***
 - One technician assigned to respond to (or manage) all unscheduled calls (daily)
 - Is generally the On-Call Technician and pulls this duty for one week
 - Typical daily volume is around 10-15 unscheduled calls – not all are critical
 - Has the authority to engage and dispatch specialty trained technicians or to utilize the 'Middle Room' (more to come on that)



Unscheduled Maintenance

- Non-Critical Repairs – Everyone Else
 - All other technicians are basically free to manage their day as they see fit with the understanding that they are accountable to the work they do or do not do.
 - Every technician is expected to draw unscheduled work from the middle room.
 - At the morning huddle, the Middle Room Count is Given with a recommended pull for each tech.
 - Any Middle Room items not pulled within 2 days are dispatched based on tech rotation.

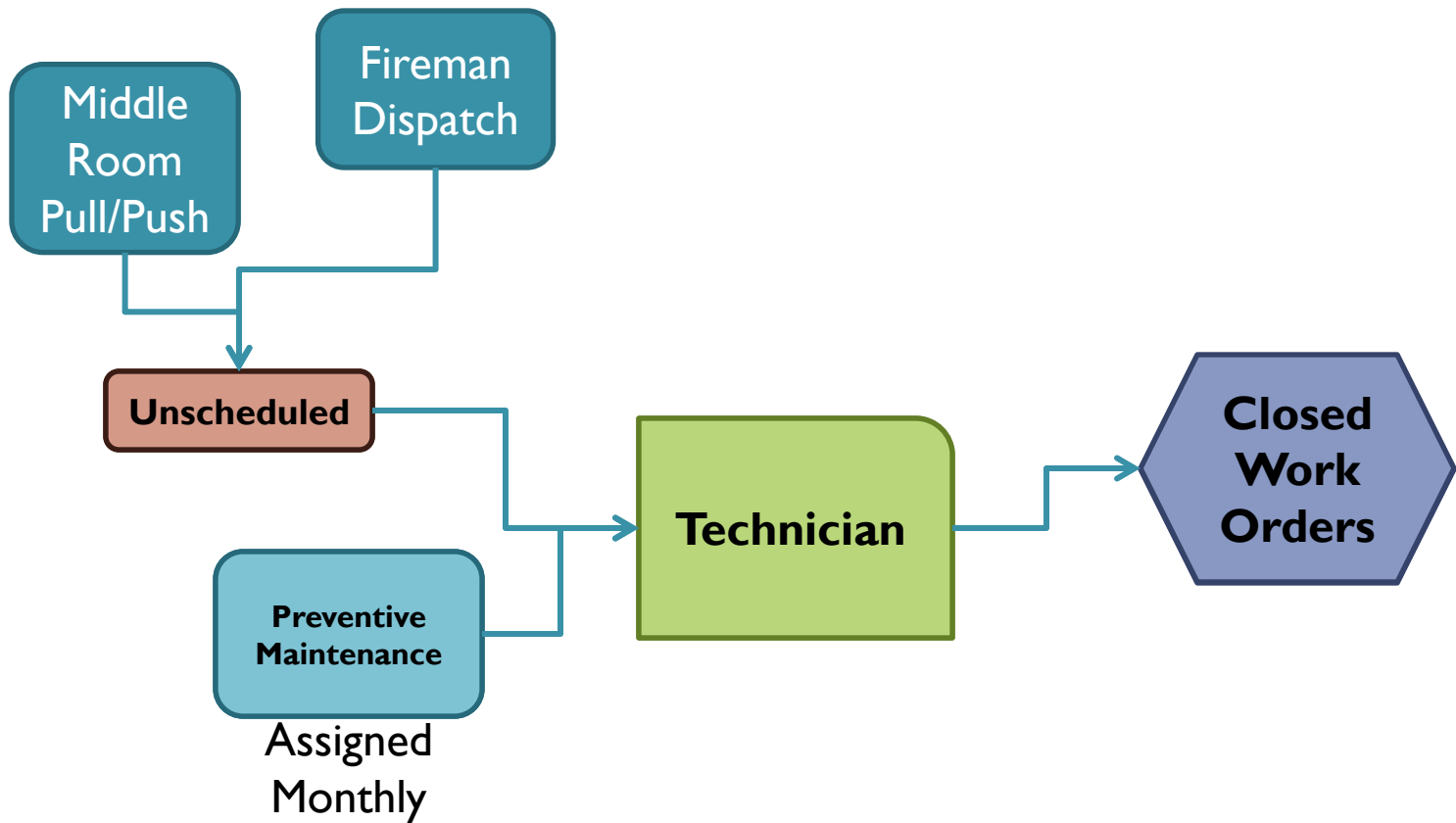


Unscheduled Maintenance

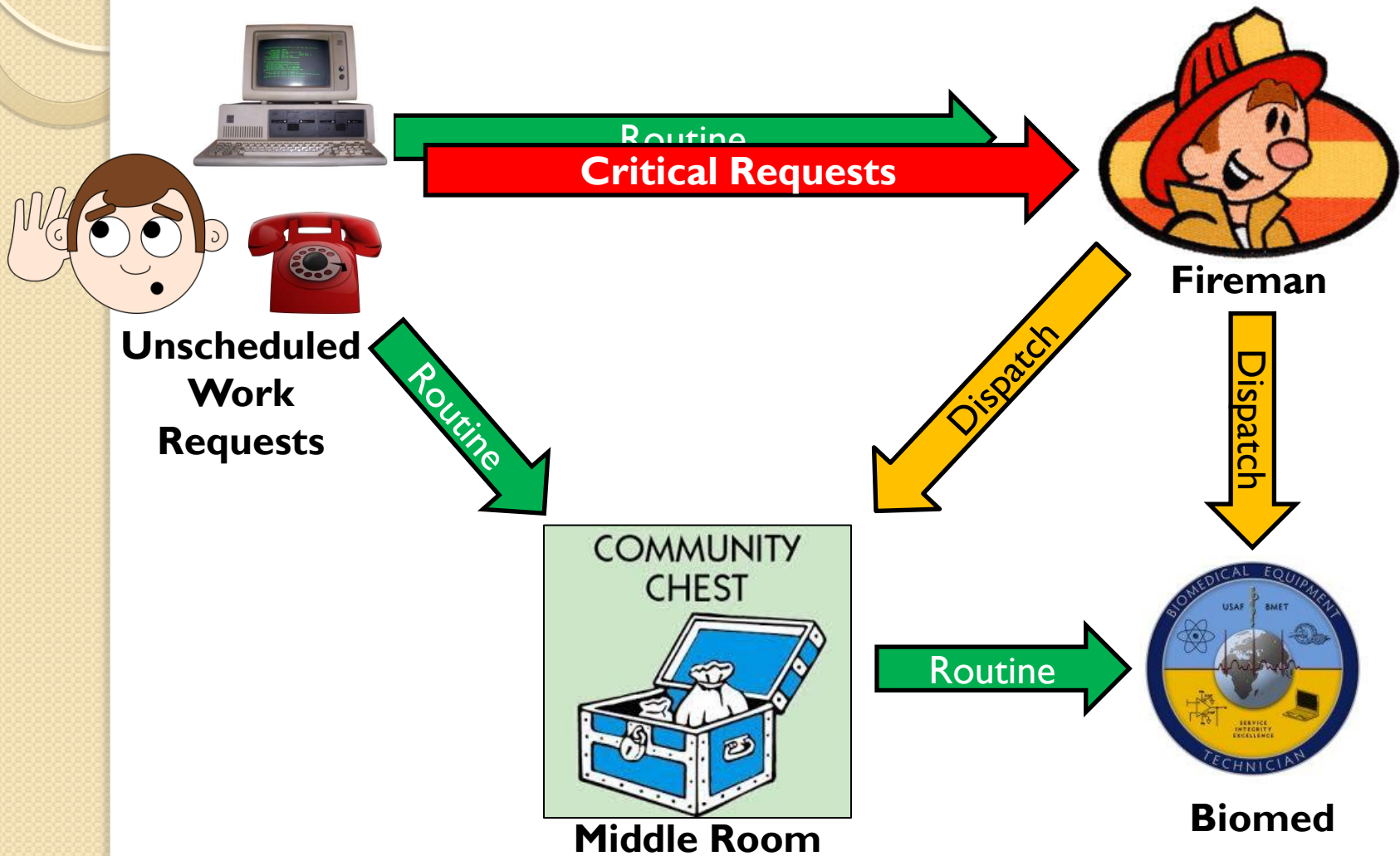
- Non-Critical Repairs – Everyone Else
 - The only unforeseen variation to the technicians day is the occasion where the Fireman dispatches a call directly to them.
 - This does happen, but based on the workload, only one or two times a week per technician, making them completely manageable events.
 - This methodology essentially sets every technician up with two ‘unscheduled inventory’ locations to draw work from on a daily basis.



Unscheduled Production Line



Unscheduled Work Flow



Technical Assignment Summary

- There are two assigned duties for routine work – The Fireman, and Everyone Else
- Everyone rotates through the Fireman Position
- Everyone is assigned a portion of the PM workload based on available time
- Everyone reports at the Morning Huddle



The Huddle



- The Huddle is essentially an Accountability meeting – not accountability to leadership, but to the process(es) that have been established in the department.
- The Huddle is not a punitive environment, but a place in which barriers to processes can be identified and eliminated.

The Huddle



- The Leader reports numbers as well based on their standard work processes.
- The Leader performs on the spot analysis of the data to identify specific areas of concern for that days productions.
- This analysis is used as a training opportunity for the staff to encourage growth in their ability to interpret data and identify barriers.

The Huddle

- All reported data is mined from the CMMS – this is where the timely closing of work order become imperative.
- The Huddle Board is located in a centralized location in the shop so that any passersby can identify assignments as well as production status at a glance.



The Huddle – Data

- **Fireman**

- Although the fireman can dispatch work orders to others, all Fireman work is reported by the Fireman.
- I keep a running tally of Unscheduled Fireman calls that are received on a daily basis – this lets us know our volume, which is how I know that we average between 40 and 60 Fireman calls a week and that Mondays are generally bigger Fireman days than the rest.



The Production Board

| | | | | | | | |
|------|--------------------------|-------------------------|--|--------------------|--------------------------|------------|-------------------|
| Date | 12 / 22 | PM% - Month | | Fireman In/Open | 12 / 17 | Fireman | Jared |
| | | PM% Goal - Day | | | | | |
| | | Middle Room Count | | Raleigh | Total Unsched | >7 Days | CNL |
| | | Middle Room Goal | | Cary | | | |
| | | Patient Impact | | WPP | | | |
| | | Anes Open | | All Sites | | | |
| | | | | HR/ NHR | | | |
| | | | | Projects | | | |
| | | | | | | | Fireman Out PM |
| | | | | | | | 3:30 |
| | | | | | | | Fireman In AM |
| | | | | | | | 7:30 |
| | | | | | | | Rad Late |
| | | | | | | | |
| | | | | | | | Rad Cary |
| | | | | | | | |
| | | | | | | | Late Today |
| | | | | | | | |
| | | | | | | | Late Tomorrow |
| | | | | | | | |
| | | | | | | | Parts |
| | | | | | | | |

The Huddle – Data

- **Middle Room**

- As discussed, the Middle Room is the central repository for unscheduled, low priority work.
- We also identified that we set an expectation as to how many devices each technicians should pull each day.
- This is a simple count, run as a report from the CMMS, divided by the total number of available technicians.

The Production Board

| | | | | | | | |
|------|--------------------------|-------------------------|----------|--------------------|--------------------------|---------|-------------------|
| Date | 12 / 22 | PM% - Month | | Fireman In/Open | 12 / 17 | Fireman | Jared |
| | | PM% Goal - Day | | | | | |
| | | Middle Room Count | 9 | Raleigh | Total Unsched | >7 Days | CNL |
| | | Middle Room Goal | 3 | Cary | | | |
| | | Patient Impact | | WPP | | | |
| | | Anes Open | | All Sites | | | |
| | | | | HR/ NHR | | | |
| | | | | Projects | | | |
| | | | | | | | Fireman Out PM |
| | | | | | | | 3:30 |
| | | | | | | | Fireman In AM |
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| | | | | | | | Rad Late |
| | | | | | | | |
| | | | | | | | Rad Cary |
| | | | | | | | |
| | | | | | | | Late Today |
| | | | | | | | |
| | | | | | | | Late Tomorrow |
| | | | | | | | |
| | | | | | | | Parts |
| | | | | | | | |

The Huddle – Data

- **Patient Impact**

- This is an interesting statistic – we are attempting to quantify the work we have to do that actually directly impacts the patient.
- This would be something like a transducer failure in an ICU where a technician actually had to enter an occupied patient room.
- The purpose is to analyze the event to see if there is something we could have done to prevent the event.

The Production Board

Date 12 / 22

PM% - Month

PM% Goal - Day

Fireman In/Open 12 / 17 Fireman Jared

| | | Total Unsched | >7 Days | CNL |
|-------------------|---|---------------|---------|-----|
| Middle Room Count | 9 | Raleigh | | |
| Middle Room Goal | 3 | Cary | | |
| Patient Impact | 4 | WPP | | |
| Anes Open | 0 | All Sites | | |
| | | HR/NHR | | |

Projects

Fireman Out PM 3:30

Fireman In AM 7:30

Rad Late

Rad Cary

Late Today

Late Tomorrow

Parts

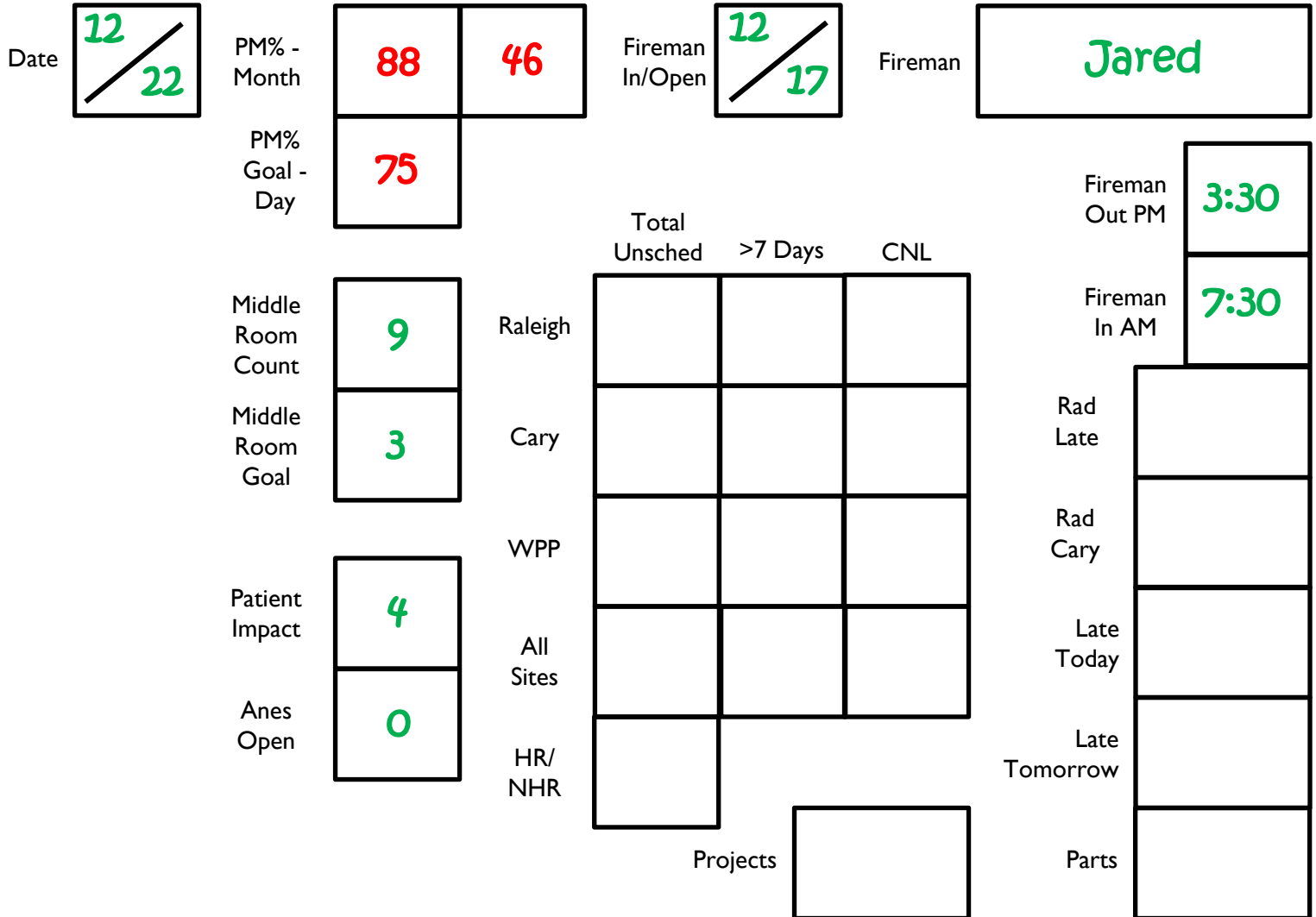
The Huddle – Data

- **PM Monitoring**

- As indicated earlier, we have established a goal of 5% per day, so the daily goal is indicated on the board.
- We also identify the current overall PM completion for the department as well as the PM completion percentage against goal.

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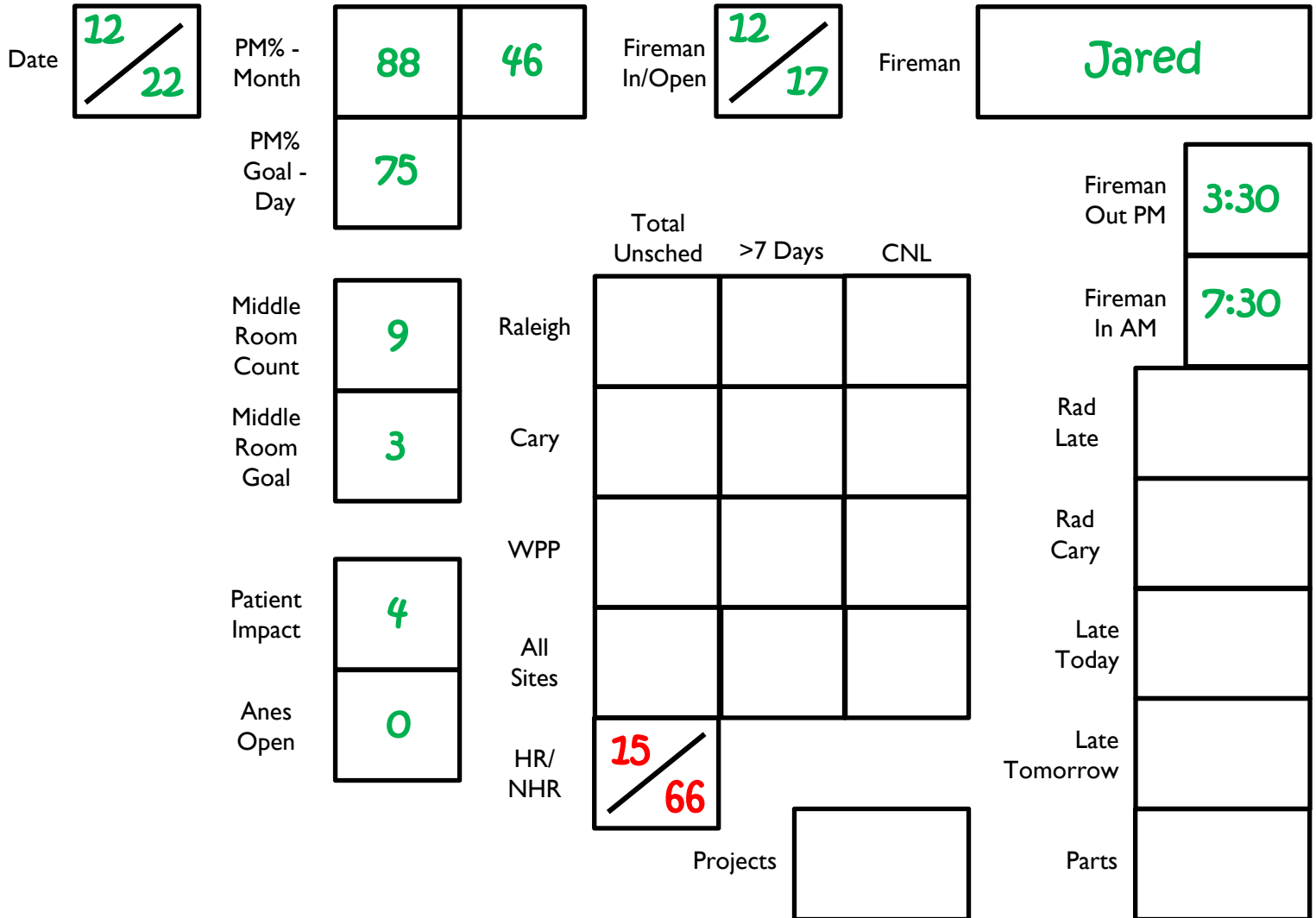
The Production Board



The Huddle – Data

- **High Risk / Non-High Risk PM's**
 - This of course is an important metric when you consider TJC/CMMS requirements, even though we are all accountable to 100% completion.
 - Since actually monitoring this metric, the technicians have been made aware and are taking a more proactive approach to getting the HR PM's done earlier in the month.
 - This is a Total Metric – not current month.

The Production Board

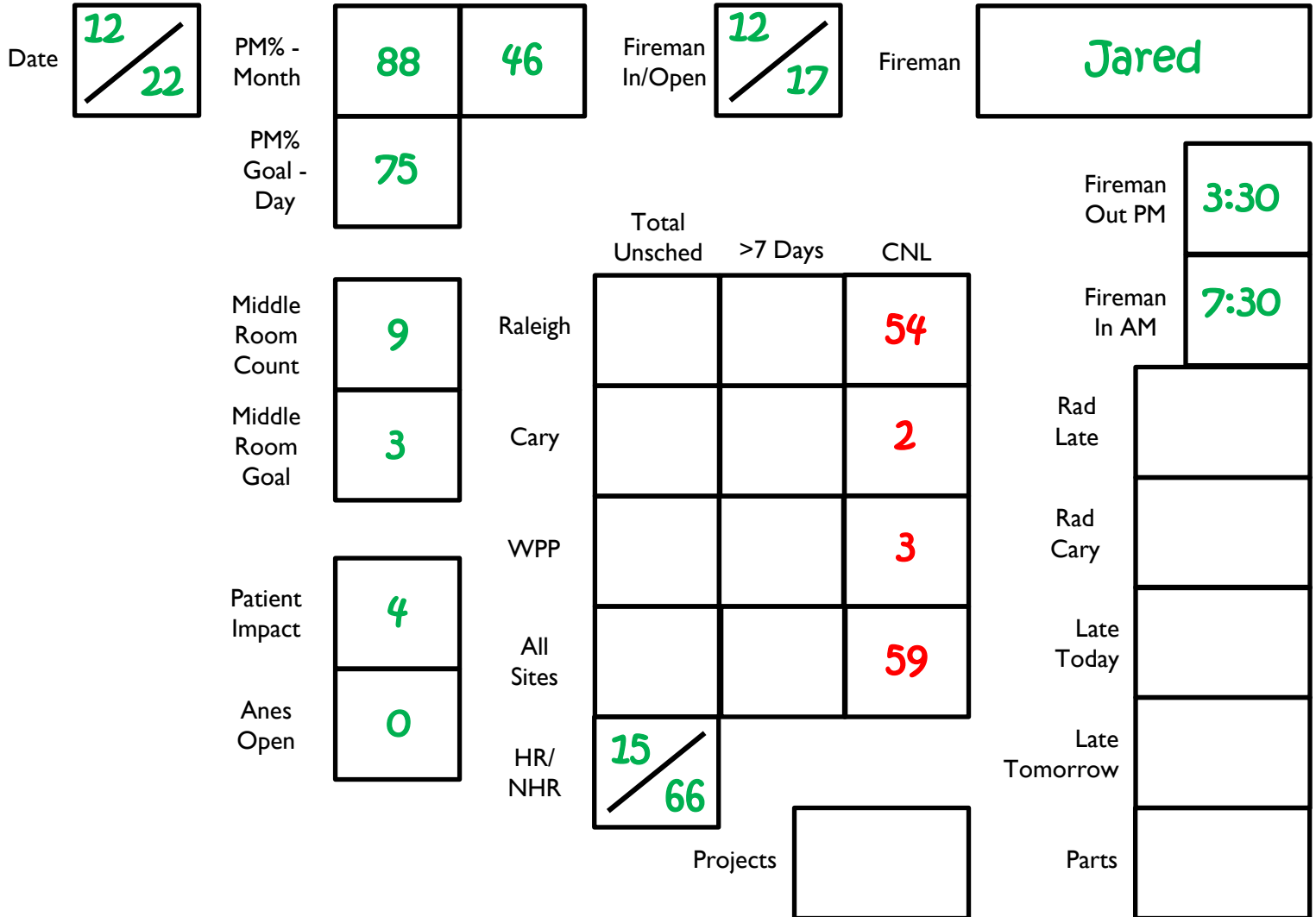


The Huddle – Data

- **Cannot Locate PM's**
 - Not always considered as they should be, this helps us to manage those PM's that cannot be completed because no one can find the device.
 - This information is reported (with details) on a bi-weekly basis to the responsible department directors as well as the EOC, which has been extremely helpful in gaining the ownership departments help in finding equipment.



The Production Board



The Huddle – Data

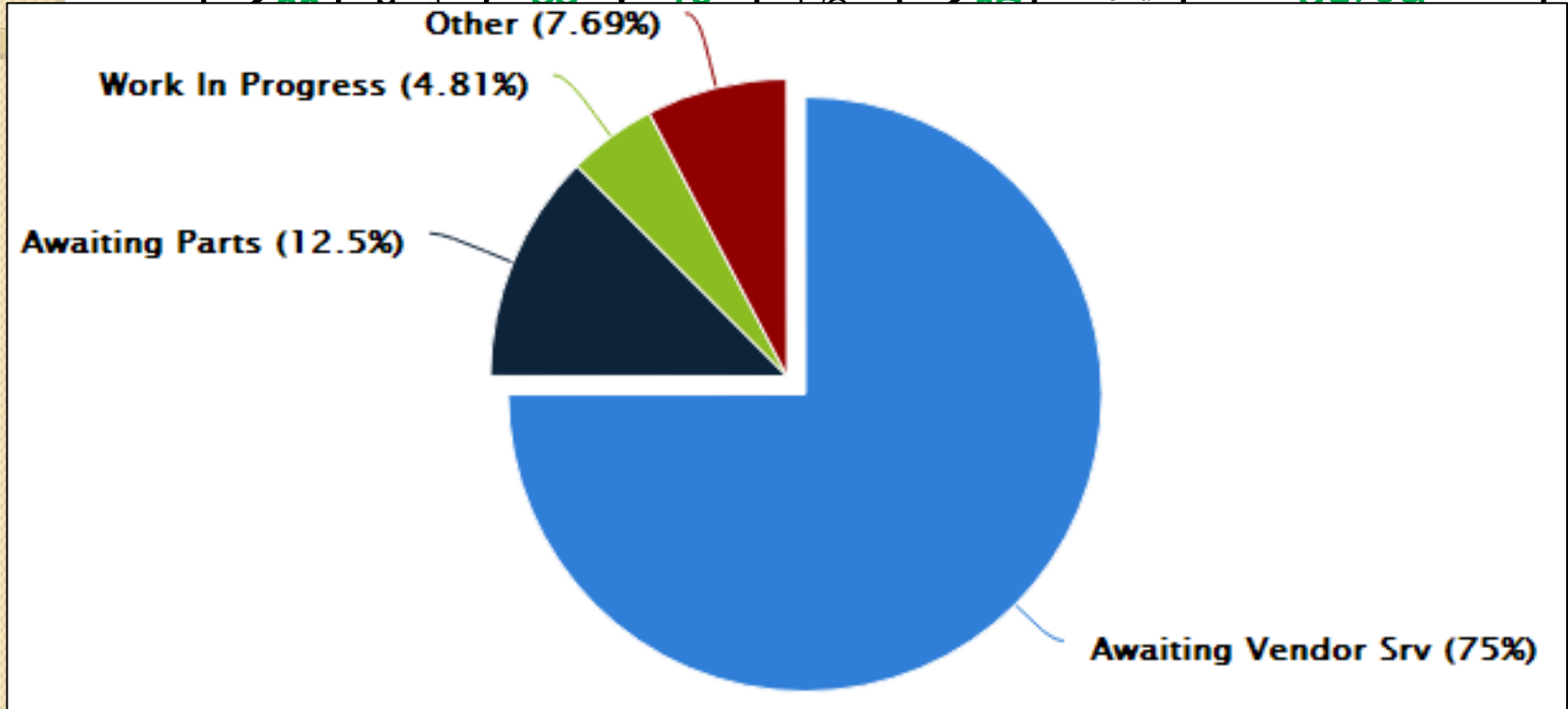
- **Unscheduled vs Actionable**

- The first part of this metric is fairly common – how many unscheduled work orders do we have open?
- The second part, ‘Actionable’ is the real data.
 - Out of all the open unscheduled work orders, how many have you not responded to yet?
 - What are the barriers to responding to a particular work order.



The Production Board

Date 12 / 22 PM% - 88 46 Fireman 12 / 22 Fireman Jared



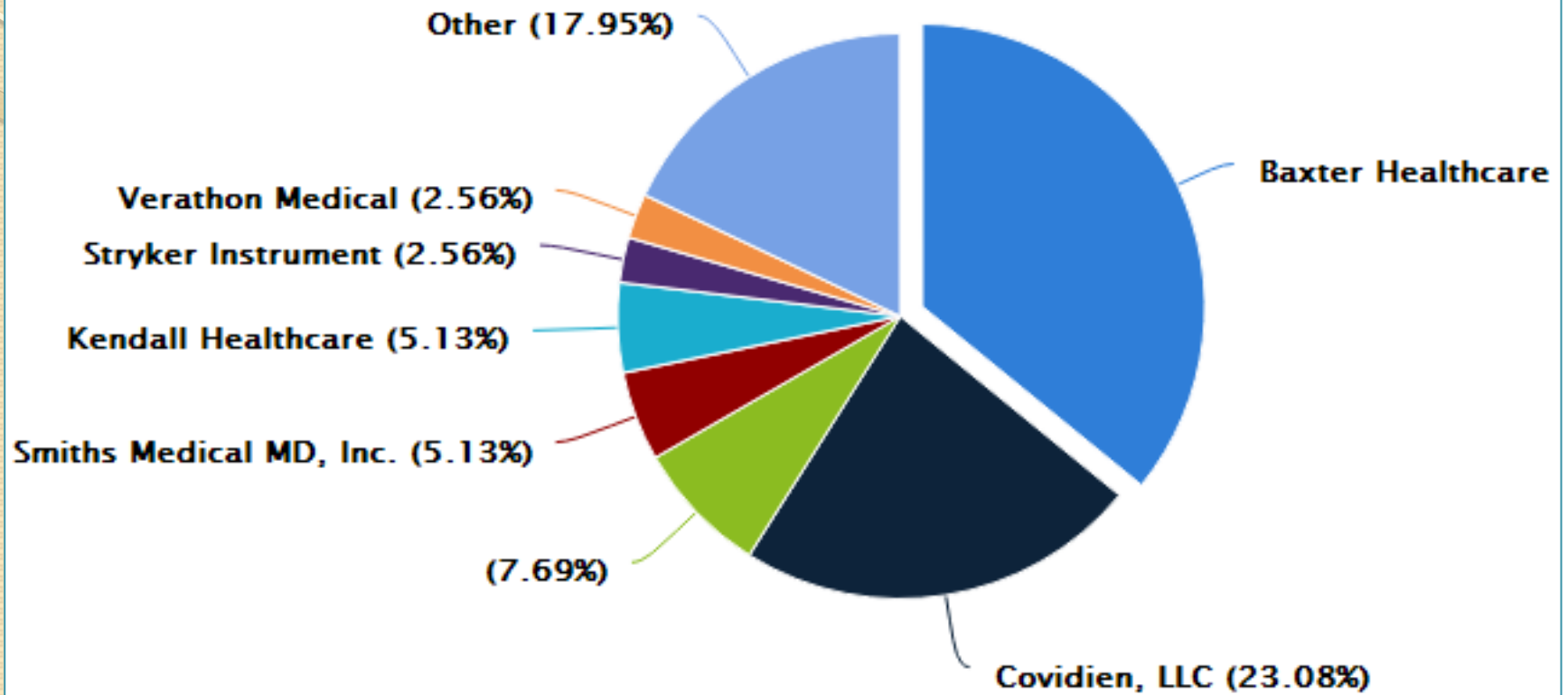
Open 0 HR/ NHR 15 / 66 Projects Late Tomorrow Parts

The Huddle – Data

- **Unscheduled vs Actionable +7**
 - This is essentially the same metric, but identifies the number of work orders that are greater than one week old.
 - These are both great indicators of your ability to respond to incoming work and get it turned around.



The Production Board



Open

HR/
NHR

25
66

Projects

Late
Tomorrow

Parts

| Date: 12/18 to 12/22 | Clinical Engineering Operations Daily Work Flow Checklist | | | | | | | | | | |
|---|---|------------------------|-----|------|-----|----------|-----|----|-----|----|---------------------|
| | Mon | Tue | Wed | Thur | Fri | Comments | | | | | |
| Clock In/First Start | 06:29 06:30 | 06:30 06:31 | | | | | | | | | |
| 1st MR Check/1st Biomed Gemba | ✓ | ✓ | | | | | | | | | |
| Dispatch SMC/VM | ✓ | ✓ | | | | | | | | | |
| Mileage Email (bimonthly) | NA | | | | | | | | | | |
| Fireman In/Open Review | - | 6 | 107 | 5 | 4 | 5 | 18 | 17 | 12 | 17 | 69/17 |
| Scopes In/Open | - | - | 2 | 2 | 2 | 0 | 2 | 0 | 2 | 0 | * |
| Throughput WO/Tech | 18 21 | 46 | 8 | 59 | 10 | 55 | 10 | 29 | 8 | 8 | * |
| Patient Impact Work Orders | - | - | 2 | 5 | 2 | 0 | 1 | 0 | 0 | 4 | |
| MR Total Open/MR Goal | 26 | 5 | 29 | 5 | 16 | 3 | 17 | 5 | 9 | 3 | |
| CE PM% Month/PM Goal | 75 | 55 | 81 | 60 | 82 | 63 | 87 | 70 | 89 | 75 | |
| CE PM's Open Current Month | 99 | | 75 | | 71 | | 50 | | 46 | | |
| Open High Risk/Non-High Risk PMs | 27 | 113 | 20 | 100 | 17 | 96 | 14 | 73 | 15 | 66 | 12/72, 10/52, 11/45 |
| Raleigh Total Unscheduled/Actionable | 119 | 27 | 123 | 38 | 111 | 23 | 109 | 22 | 108 | 16 | |
| Raleigh Total Unscheduled +7/Actionable | 73 | 7 | 67 | 8 | 66 | 7 | 68 | 7 | 69 | 4 | |
| Cary Total Unscheduled/Actionable | 33 | 7 | 30 | 1 | 28 | 4 | 22 | 1 | 15 | 10 | |
| Cary Total Unscheduled +7/Actionable | 22 | 1 | 19 | 1 | 16 | - | 13 | - | 11 | 0 | |
| WPP Total Unscheduled/Actionable | 22 | 2 | 26 | 6 | 28 | 7 | 27 | 4 | 19 | 2 | |
| WPP Total Unscheduled +7/Actionable | 17 | - | 18 | - | 19 | 1 | 17 | - | 14 | 0 | |
| Total Unscheduled/Actionable | 174 | 36 | 179 | 45 | 167 | 34 | 158 | 26 | 142 | 18 | |
| Total Unscheduled +7/Actionable | 112 | 8 | 104 | 9 | 101 | 8 | 98 | 7 | 94 | 4 | |
| CNL Cary/CNL WPP | 1 | 3 | 1 | 3 | 1 | 3 | 1 | 3 | 2 | 3 | |
| CNL Raleigh/CNL Total | 53 | 57 | 53 | 57 | 53 | 57 | 53 | 57 | 54 | 59 | |
| Img Total Unscheduled/Actionable | 36 | 14 | 43 | 13 | 42 | 12 | 41 | 14 | 41 | 16 | |
| Img Total Unscheduled +7/Actionable | 22 | 8 | 24 | 9 | 24 | 8 | 25 | 9 | 27 | 8 | |
| Alerts&Recalls/+30 | 23 | 12 | 23 | 12 | 23 | 12 | 23 | 12 | 23 | 12 | |
| Initial Inspections/+30 | 4 | 2 | 4 | 2 | 4 | 2 | 4 | 2 | 4 | 2 | |
| Hold For Inforamtion/+7 | 6 | 3 | 5 | 3 | 5 | 4 | 4 | 3 | 2 | 2 | |
| Img PM% Current Month/PM Goal | 61 | 55 | 72 | 60 | 78 | 65 | 81 | 70 | 81 | 75 | |
| Img PM's Open Current Month | 9 | 14 | 10 | | 8 | | 7 | | 7 | | |

The Huddle – Data



- **Technician Reporting**

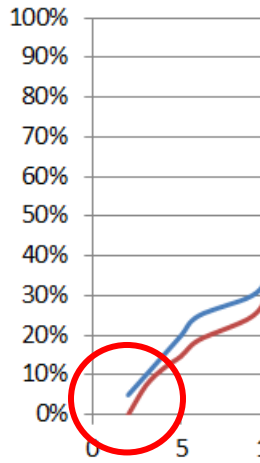
- All of the corporate data collected is really nothing more than the consolidation of each individual technician's daily number.
- In order to ensure that the technician are taking ownership of their data on a daily basis, we require them to report it at the huddle.
- Tools were created to aid in the collection and standardization of data provided.

The Huddle – Data

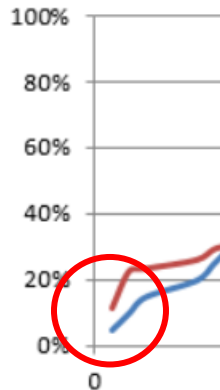
| | | | | |
|--|--------|----------------|----------------|----|
| The End of Month is | | | | 50 |
| PM's at the Beginning of the Month | 29 | | | |
| You have PM's Remaining | 29 | | | |
| My Current PM Completion Rate | 0% | | | |
| My Daily Goal is | -2.1 | PMs. | | |
| My Daily <u>Stretch</u> Goal Is | 29.0 | PMs. | | |
| Today is | Monday | | | |
| My Remaining Goal for the Week is | -10.4 | PMs. | | |
| My Remaining Stretch Goal for the Week is | -8.1 | PMs. | | |
| <i>Meeting the stretch goal will get you done with a week to spare in the month.</i> | | | | |
| Back Up | | | | |
| PM Percentage Completed | 0% | | | |
| High Risk PMs | 2 | Vendor Repairs | Awaiting Parts | |
| Total Unscheduled Greater Than 1 Week | 9 | 6 | 3 | |
| Yesterday's Middle Room WO's Closed | 4 | | | |

The Huddle – Data

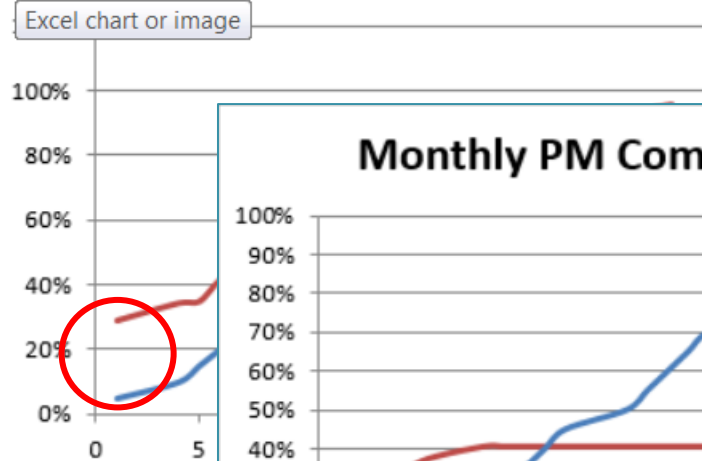
Monthly PM Completion vs Goal



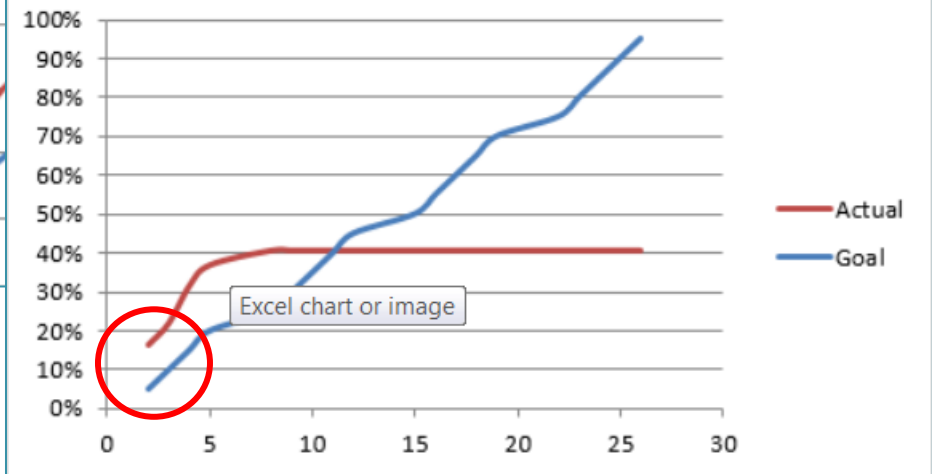
Monthly PM Completion vs Goal



Monthly PM Completion vs Goal

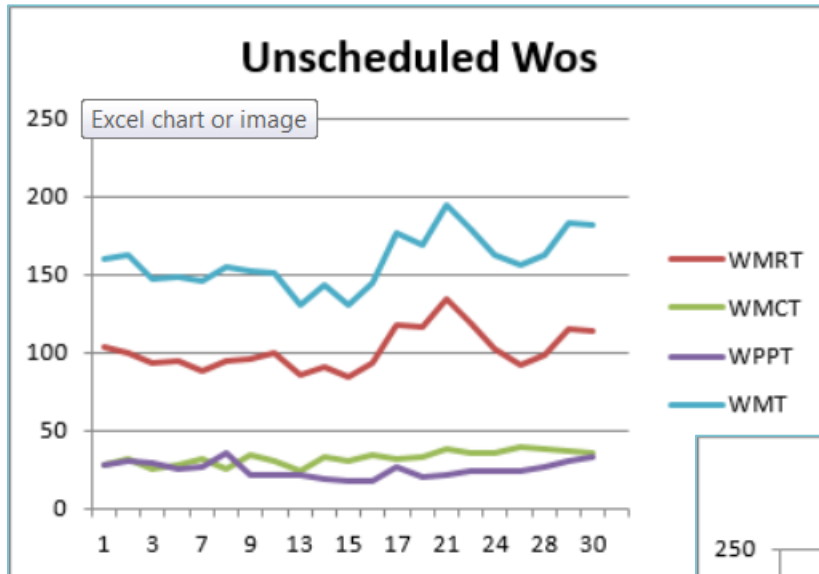


Monthly PM Completion vs Goal

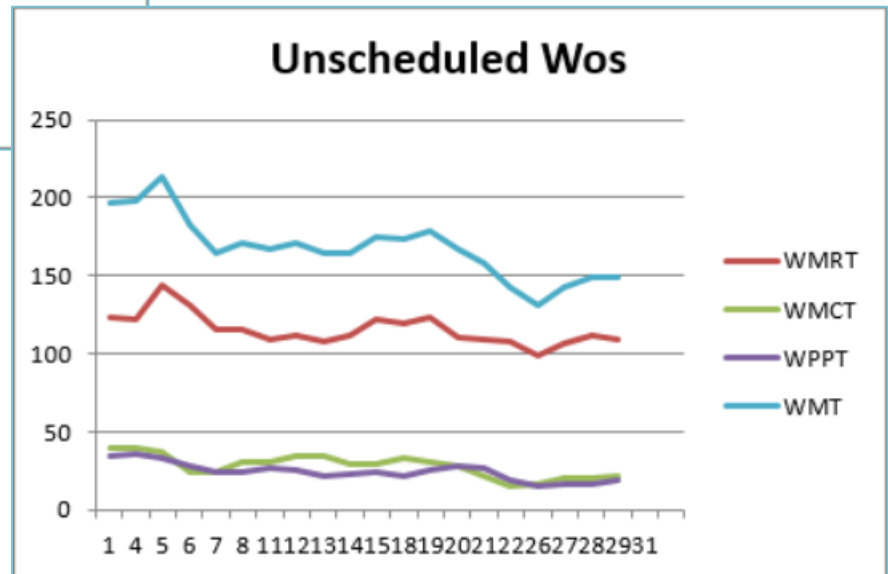


January 2018 (1/9)

The Huddle

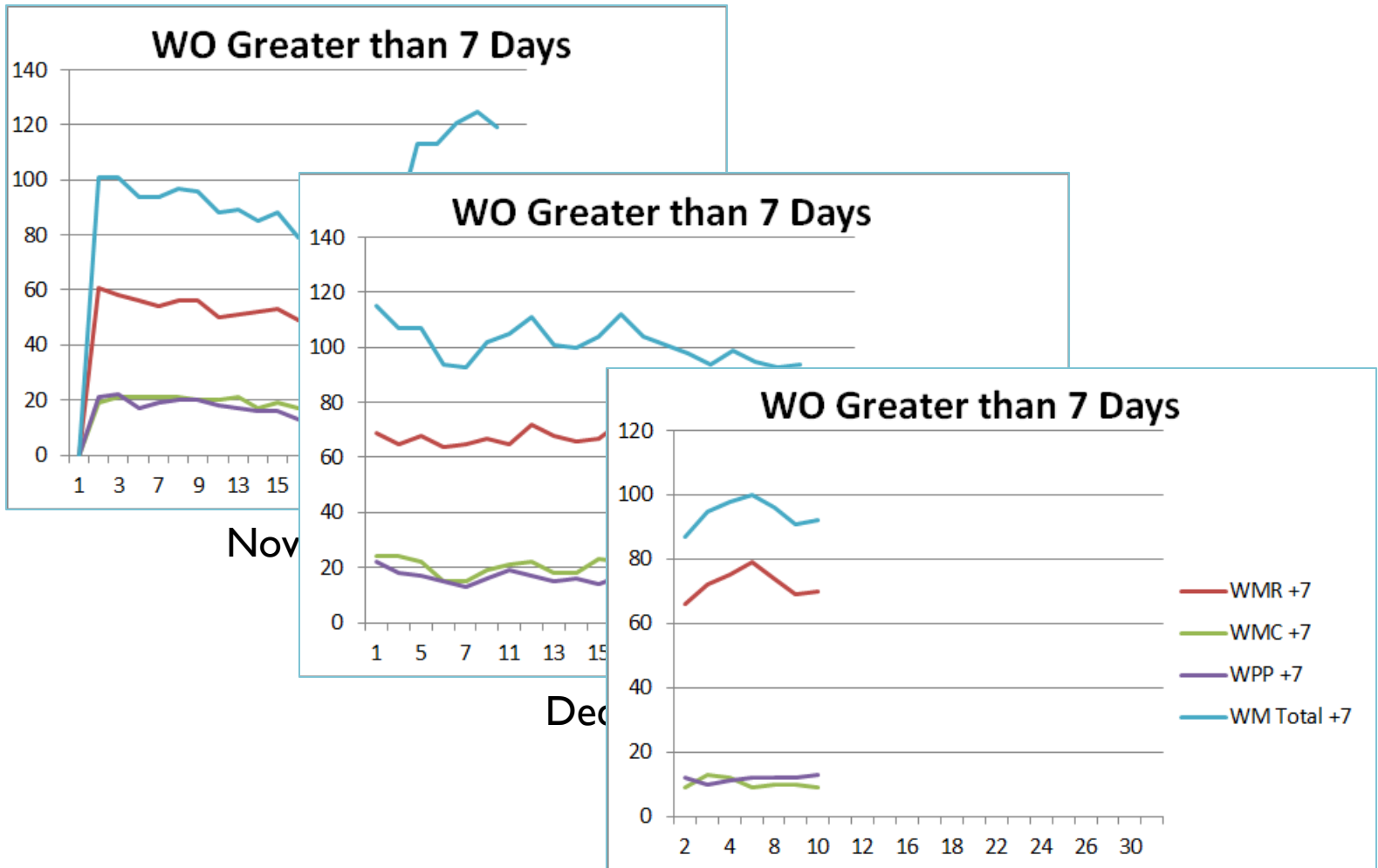


November 2017



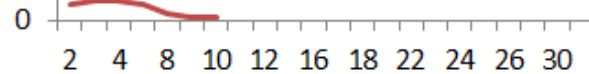
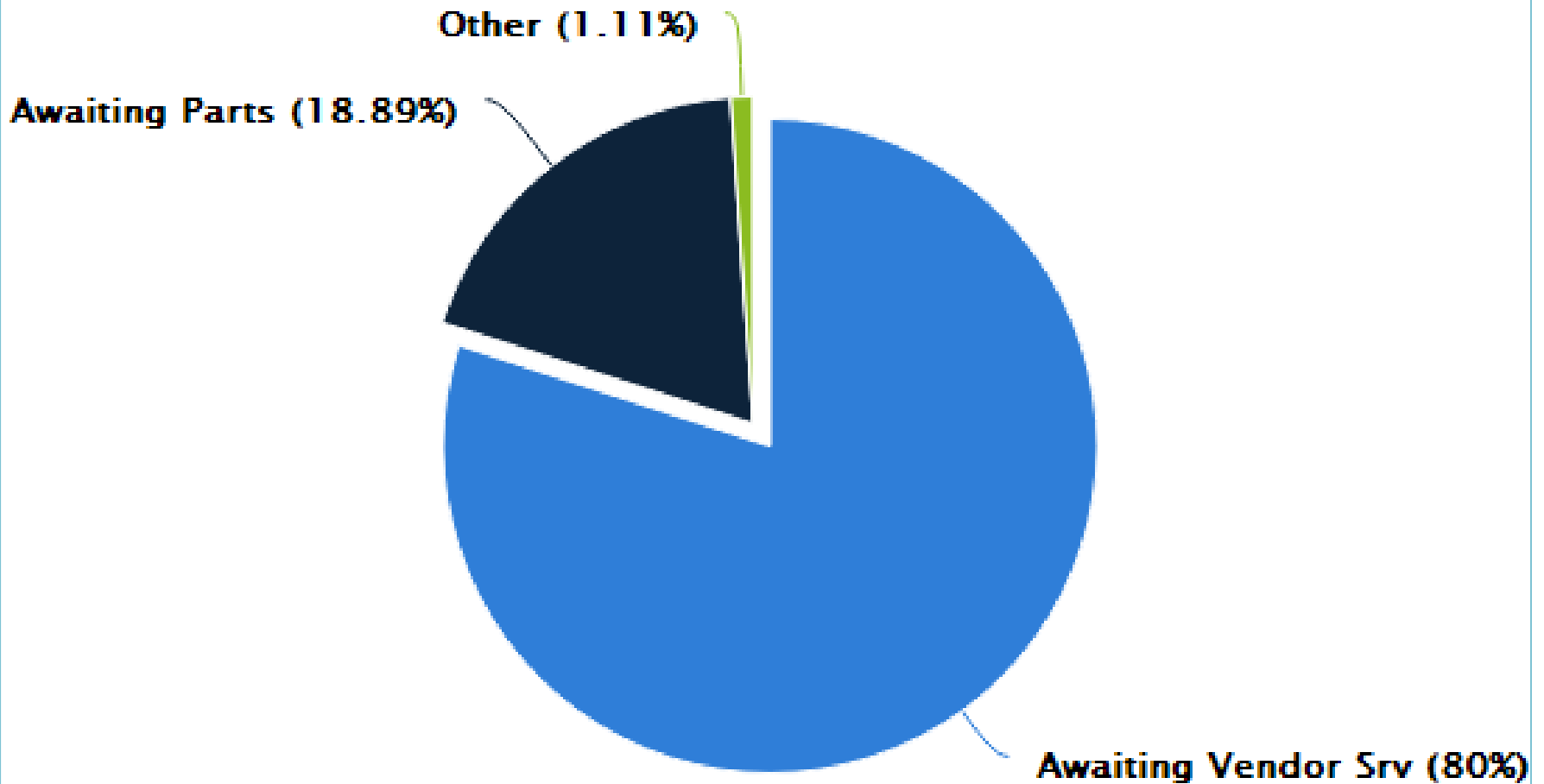
December 2017

The Huddle



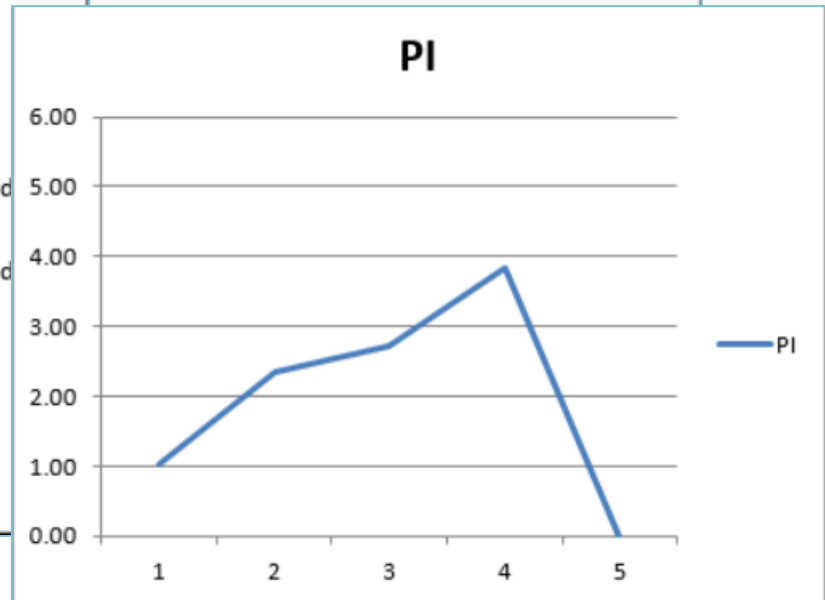
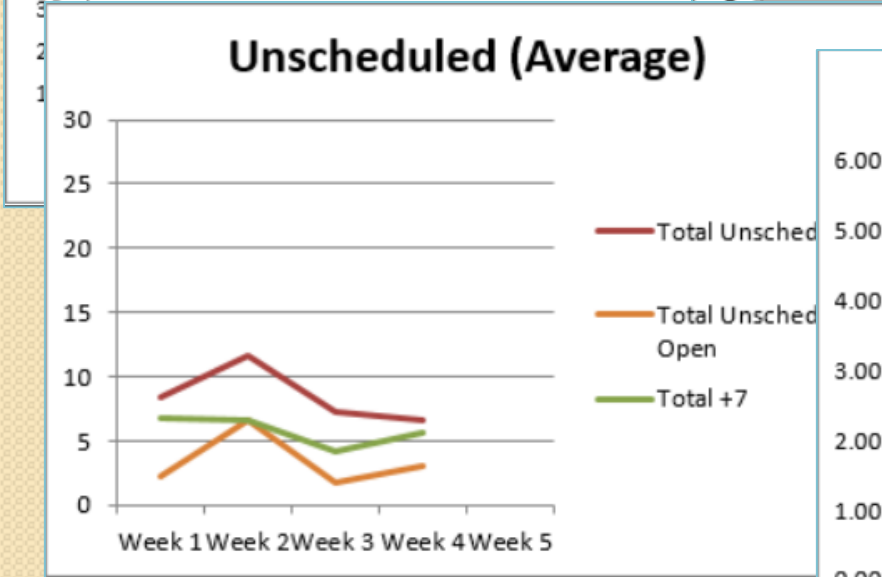
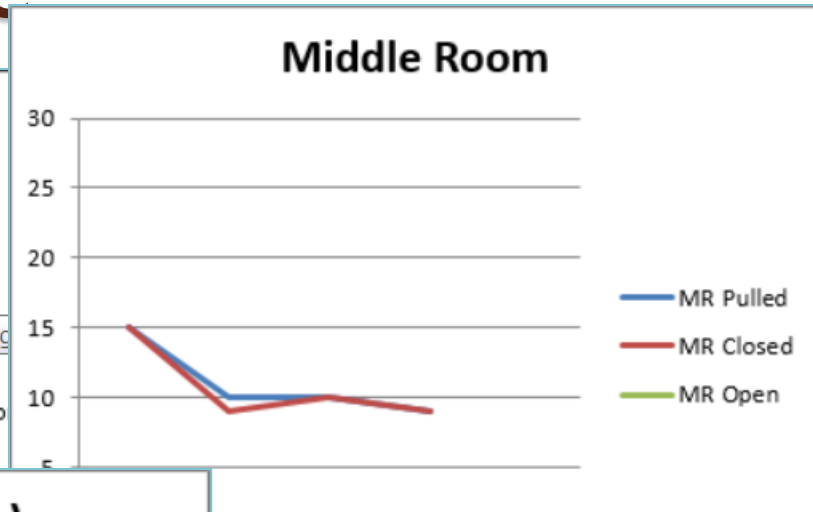
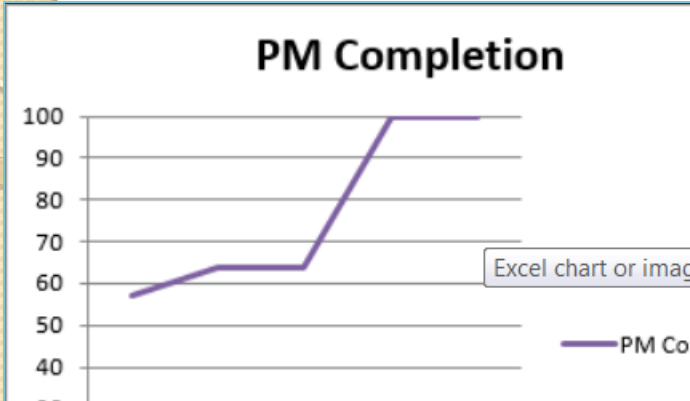
January 2018 (1/10)

The Huddle



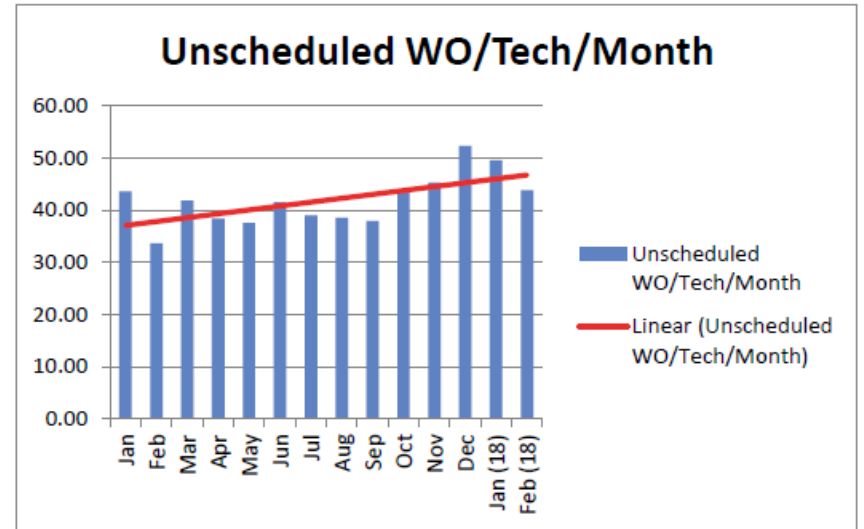
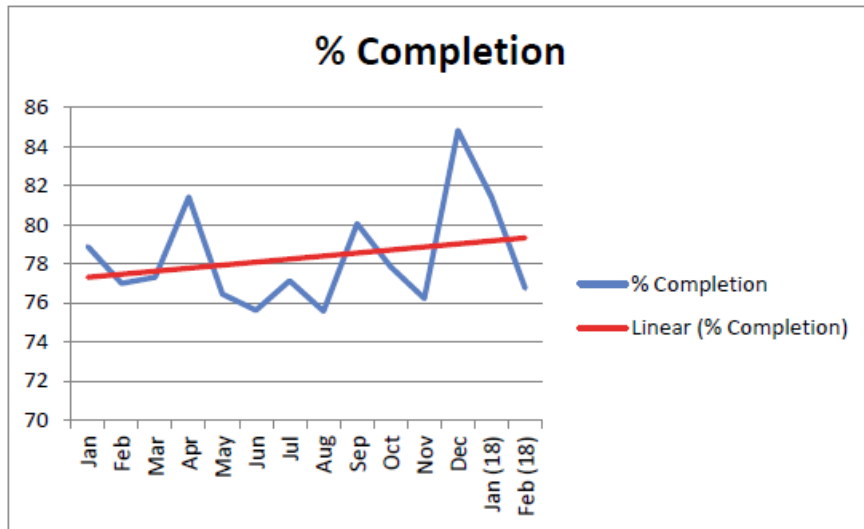
January 2018

The Huddle



The Pay Off

| Per Month | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | Jan (18) | Feb (18) |
|--------------|-------|-------|-------|-------|-------|-------|-------|--------|--------|-------------------|-------------------|-------------------|----------|----------|
| % Completion | 78.89 | 77 | 77.31 | 81.41 | 76.46 | 75.63 | 77.14 | 75.58 | 80.05 | 77.85 | 76.23 | 84.82 | 81.4 | 76.75 |
| Assigned | 995 | 786 | 974 | 850 | 874 | 989 | 910 | 868 | 807 | 894 | 892 | 863 | 914 | 856 |
| Completed | 785 | 606 | 753 | 692 | 677 | 748 | 702 | 656 | 646 | 696 | 680 | 732 | 744 | 657 |
| Techs | 18 | 18 | 18 | 18 | 18 | 18 | 18 | 17 | 17 | 16 | 15 | 14 | 15 | 15 |
| WO/Tech | 43.61 | 33.67 | 41.83 | 38.44 | 37.61 | 41.56 | 39.00 | 38.59 | 38.00 | 43.50 | 45.33 | 52.29 | 49.60 | 43.80 |
| | | | | | | | | 1 FMLA | 1 FMLA | 1 FMLA, 1 Open | 1 FMLA, 2 Open | 1 FMLA, 3 Open | 3 Open | 3 Open |



Summary



- Through a simple, yet somewhat lengthy development process of:
 - Policy and Process Standardization
 - Redefining of Technical Rolls
 - Establishment of Standard Work
 - Monitoring of Common Metrics

You can achieve great success in running your business.



Questions