

Monitoring Preventative Maintenance Quality

Presenters: Arleen Thukral, MS, CCE, CHTM
Michael Price, CHTM



Introduction



Arleen Thukral has over 10 years of experience in the development and management of a complex, professional, highly technical healthcare technology management program that meets or exceeds Joint Commission, NFPA, OIG, FDA and other applicable healthcare regulatory requirements in New York and New Jersey VA Medical Centers. She leads a team of dedicated HTM professionals (over 130 service line staff) supporting 9 medical centers and transition to a new CMMS (Nuvolo). The program is responsible for over \$543M dollars of medical technology and provides safe, reliable maintained medical equipment for the delivery of quality health care in a cost-efficient manner (\$54M cost saving/avoidance). Previously, Ms. Thukral worked on VA's \$16B 10 year EHR modernization project in V20 VA North West Health Network and oversaw a full range of supervisory and managerial functions at Seattle Fresno VAMC. She began her tenure with the Department of Veteran Affairs through the Technical Career Field (TCF) program and became Chief Biomedical Engineer in 2014 at Fresno, CA, VA Hospital. She is a past president of California Medical Instrumentation Association, San Joaquin Valley Chapter. She has been an active member of AAMI Equipment committee, HTCC, ACCE education committee and recipient of AAMI 2024 Young Professional of the Year award.



MD EXPO
New England • October 8-10, 2024



Education: MS and BS, Biomedical Engineering, Rensselaer Polytechnic Institute | VHA Healthcare Leadership Development Program- 2016 cohort | VA Health Informatics Program AMIA 10x10 | Certified Clinical Engineer | Certified Healthcare Technology Manager

Introduction



Michael Price's journey in the healthcare technology management (HTM) field is a testament to his dedication and hard work. Starting in the private sector as an entry-level technician in 2007, Michael demonstrated a strong work ethic and passion for patient safety, which over time propelled him to his current role of supervisor of Finger Lakes HTM. During his career, he has attended technical training classes such as dialysis and ventilators to photopheresis and sterilizers. Currently overseeing a team of 8 technicians, Michael's leadership is marked by his focus on Key Performance Indicators (KPIs) and a commitment to maintaining the highest standards of safety. Through his emphasis on implementing efficient processes and systems, Michael has streamlined workflow within the department, resulting in enhanced productivity and of service delivery. His journey from an entry-level tech to a supervisory role showcases his ability to drive success through a strategic focus on KPIs, patient safety, and excellence in the HTM field.



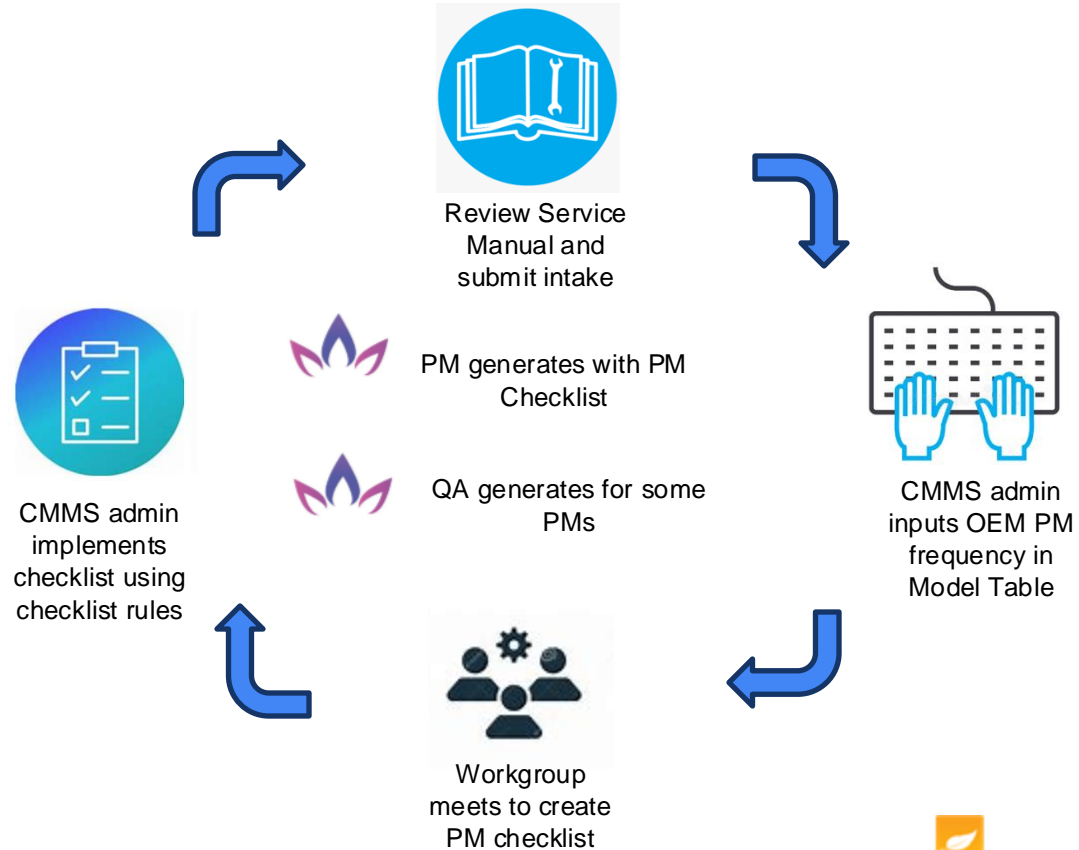
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New England • October 8-10, 2024

Education: AAS, Computer and electronics Systems, Alfred State
A+ | Net + | CHTM | VHA Healthcare Development Program

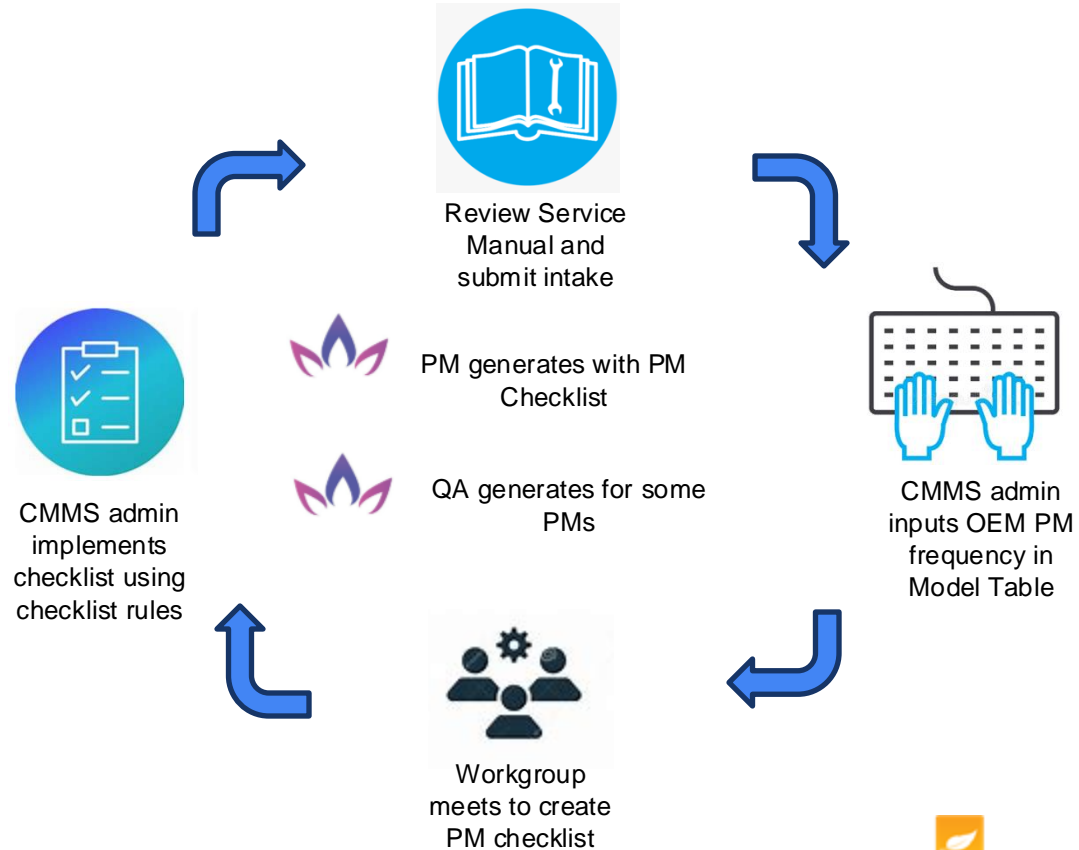
Preventative Maintenance (PM) Quality Life Cycle

- Repeat service manual review before PM for revisions to procedure or frequency
- QA trends are monitored and addressed through training or improvements



Preventative Maintenance (PM) CMMS Plan limitations

- Lack of parent child PM WOs for multiple frequencies
 - Specific reports designed to help front line staff to avoid confusion with duplicates
 - Multiple maintenance definitions for multiple frequencies
- Specific reports to track OEM PM conformance



PM Quality Metrics

- Trend QA fail %

$$\frac{1 - \text{QAFail Resolution Code}}{\text{QAs generated}}$$

- Trend department OEM PM Conformance

$$\frac{1 - (\text{Device}_{\text{Missing PM}} + \text{Device}_{\text{Wrong PM Schedule}})}{\text{Number of Medical Equipment}}$$

*models excluded if PM requirements are flexible (service manual allows for local variation)

**number of measurable exceptions is dependent on the number of OEM PM model intakes; Can trend down based on % of inventory impacted by OEM PM decisions

***excludes devices on AEM

Define PM Quality Objectives

- PMs are being conducted according to manufacturer requirements or AEM requirements
- Establish data accuracy requirements to measure baselines
 - What is a PM QA Fail?
 - Is device naming accurate?
 - What are the required PM tasks in a PM procedure?
- Establish frequency review goals based on priorities
 - established naming standard and risk
- Establish sustainment goals
 - Updating SOPs

PM Documentation Requirements

- Is documentation of procedure results thorough enough?
 - Entry level BMET reviewing PM history can understand what steps were performed
- Judgment and Adaptability
 - While checklist provides structure, they should complement professional judgement rather than replace it.

PM Checklist Benefits

- Cognitive Aid: Checklists act as a cognitive net that helps BMET remember essential steps, especially in complex tasks where human error is prevalent
- Standardization: They establish a baseline for performance, ensuring that even experienced individuals do not overlook critical details.
- Automation: Checklist can be designed to Fail and generate a CM work order
- Error Reduction: The use of checklists has been shown to significantly decrease mistakes in high-stakes environments, such as surgeries and aviation.

PM Checklist Design Considerations

- Types of checklists
 - Do-confirm checklists: Team members perform task from memory and then use the checklist to confirm completion
 - Read-do checklists: Users follow the checklist step-by-step, similar to a recipe (sequential execution)
- Design considerations
 - Brevity: concise (no more than 5-9 items)
 - Clarity: simple wording (unit specified)
 - input type-True/False, with default response where applicable
 - Visual Design: fit on one page, be free of clutter and use readable fonts
 - Task Types: Precautionary, qualitative, quantitative and instructions

PM Checklist Challenges to Adoption

- **Resistance to Change**
 - Professional Autonomy: BMETs may resist checklists, viewing them as an insult to their expertise or a threat to their autonomy
 - Oversimplification Concerns: Some may view checklists as an oversimplification of complex processes, potentially leading to a false sense of security
 - Time Constraints
- **Design and Implementation Issues**
 - Poor Checklist design
 - How does the checklist trigger? Is naming conformance accurate enough to reliably generate checklist?
 - Lack of customization
 - Checklist fatigue
- **Organizational Challenges**
 - Inadequate training (how to save as you go)
- **Technical Challenges**
 - Checklist trigger Skip Errors
 - Updating checklist

Strategies to Increase PM Checklist Adoption

- **Leadership Engagement**
 - Resource allocation: Provide necessary resources for checklist development, implementation and ongoing maintenance
 - Cultural shift: Promote checklists as tools for teamwork and communication (mark of professionalism)
 - Formalize communication: Clearly communicate the rationale behind checklist use and benefits to facility leadership and BMETs
- **User-centered Design**
 - Involve End-Users: Engage the BMETs who will use the checklists in the development process (support decision-making)
- **Customization**
 - Tailor checklists to specific contexts and workflows to ensure relevance and practicality
- **Training**
 - Conduct office hours to practice using checklists and provide process for new employee training
- **Feedback and Improvement**
 - Establish a process for periodic review and updating checklists based on user feedback
 - Track and share data on how checklist use impacts performance and safety

PM Quality Assurance

- 2% of PM WOs generate a PM QA WO
- Utilization of sticker photos

Question
Label Updated and visible?
Case Cleanliness
Old Label removed?
Appropriate Documented Procedures?
Current Frequency?
Comments (use to explain responses above)
Resolution details documented appropriately?
If networked, "networked" checked appropriately.
If networked, SMAK enabled & vulnerabilities patched?
If networked, AV installed and patched

Process Improvement Resulting from PM QAs

- Vendor service report missing/vendor work documentation
- Missing procedure step
- Physicist inspection not attached
- Expired PM sticker
- Mismatch vendor and PM sticker
- Mismatch Vendor PM month to Maintenance def month in CMMS
- Missing parts/pricing for PM kits
- Inventory Naming issues

Successful QA PM

Manage Attachments (3): [IMG_0526.jpg \[download\]](#) [IMG_0527.jpg \[download\]](#) [IMG_0528.jpg \[download\]](#)

Draft	Pending Assignment	Assigned	Ready for Work	Work In Progress	On Hold	Pending Review	Closed
Due Date	07/09/2024 23:59:59	Priority	3 - Moderate	Issue Brief	Not Required	State	Closed Complete
Number	CWKD068552	Asset	HTM FLX Canandaigua	Assigned To	Clara Manske (VHACANManskC)	First Assigned Technician	Clara Manske (VHACANManskC)
Work Order Type	Quality Assurance	Asset ID	225338	Additional Assignee List		Parent Work Order	CWKD0503956
Work Location	204-0082-CN-528	Asset Type	TABLES: EXAM/TREATMENT	Work Project		Work Order Summary	Quality Assurance Preventive Maintenance WO for CWKD0503956
Asset/Location	Asset	Model	GALAXY ULTIMATE	Brief Description		Problem Cause	QA Check - Preventative
Asset	225338	Initiation Reason	Audit WO	Resolution Code	Pass	Scheduled Start Time	04/09/2024 00:14:32
Asset Type	TABLES: EXAM/TREATMENT	Resolution Detail	stickers verified and procedureds documented, pass	Service Complete Date	06/28/2024 10:45:01		
Model	GALAXY ULTIMATE						
Initiation Reason	Audit WO						



Asset Details	Customer Details	Additional Resolution Details	Details	Financial	Schedule	Vendor
Manufacturer	LLLOYD TABLE COMPANY	Networked				
Serial Number	80317	Software Version Number				
Owning Department	528A5-283CN-PHY MED&REHAB SVC	Last PM (Non-Deferred)	05/30/2024 12:58:19			
Status	In Use	Under Contract?				
Operational Status	Operational	Next Scheduled Maintenance	04/01/2025 07:00:00			

Signature Pad

Related Links
Show SLA Timelines

Parts/Services (1) | Contract Coverage | Work Order History (14) | Next PM Due (1) | Hazard/Recall Alert | Checklist Data (20) | Related OIT Incidents | Related OIT Requests | Cermer - Remedy | Approvals | Test Equipment

Related Knowledge | Work Order/SLA (4) | Attachments (3) | Asset Utilization | Clinical Work Order/Task

Number Search Actions on selected rows...

Work Order = CWKD068552

Successful PM Documentation

- Example of A successful documentation on a PM for CT machine
- Vendor Service Report attached
- Time documented
- Sticker updated after vendor completed inspection to match vendor date of inspection.
- Verified Next scheduled maintenance date

Manage Attachments (1): EE#247339 Cdge Definition D... [download]

Draft ✓ Pending Assignment ✓ Assigned ✓ Ready for Work ✓ Work in Progress ✓ On Hold ✓ Pending Review ✓ Closed

Due Date: 12/20/2023 23:59:59
Number: CWKD0287450
Work Order Type: Preventive Maintenance
Work Location: 24018-0022-CN-528
Asset/Location?: Asset
Asset: 247339
Asset Type: SCANNING SYSTEMS: CT
Model: SOMATOM DEFINITION AS
Scheduled Maintenance: VISN 2 FLX - Not High Risk Preventive Maintenance
Initiation Reason: Scheduled

Priority: 1 - Critical
Issue Brief: Not Required
State: Closed Complete
Substate:
Assignment Group: HTM FLX Imaging
Assigned To: [Redacted]
First Assigned Technician: [Redacted]
Additional Assignee List:
Work Project:

Work Order Summary: Not High Risk Preventive Maintenance for Model: SOMATOM DEFINITION AS - semi-Annual
Brief Description:
Problem Cause: Preventive Maintenance
Resolution Code: Pass
Resolution Detail: Preventive Maintenance: Preventive Maintenance: Pass:
Attach Service Records or Test Procedures and Results.
Service report attached

Scheduled Start Time: 11/01/2023 10:00:00
Service Complete Date: 12/19/2023 10:49:57

Asset Details Customer Details Additional Resolution Details Details Financial Schedule Vendor

Manufacturer: SIEMENS HEALTHCARE DIAGNOSTICS INC
Serial Number: 5392
Owning Department: 528AS-360CN-RADIOLOGY
Status: In Use
Operational Status: Operational

Networked:
Software Version Number:
Last PM (Non-Deferred): 07/17/2024 15:32:22
Under Contract?:
Next Scheduled Maintenance: 12/01/2024 06:00:00

Signature Pad
Related Links
Show SLA Timeline

Parts/Services (2) Contract Coverage Work Order History (30) Next PM Due (1) Hazard/Recall Alert Checklist Data Related OIT Incidents Related OIT Requests Carner - Remedy Approvers Test Equipment

Related Knowledge Work Order SLA (4) Attachments (1) Asset Utilization Clinical Work Order Tasks

Work Order + CWKD0287450

Number	Amount	Summary	Work Duration	Type	Technician
WOITC9042257	\$22,525		30 Minutes	Labor	[Redacted]
WOITC9042260	\$0.00	This PM was performed with the protocol...	6 Hours 30 Minutes	Labor	[Redacted]

Improper PM documentation

- Missing attached Service Report on a Portable X-ray PM.
- Missing any notes to state why the service report is not attached or where it is.

Clinical Work Orders
CWKDD0128064 View: AssetUser

Follow Signature Pad

Draft Pending Assignment Assigned Ready for Work Work in Progress On Hold Pending Review Closed

Due Date 07/30/2023 23:59:59 Priority 3 - Moderate
Number CWKDD0128064 Issue Brief Not Required
Work Order Type Preventive Maintenance State Closed Complete
Work Location O121-76-BH-528 Substate
Asset/Location? Asset Assignment Group HTM FLX Imaging
Asset 249435 Assigned To
Asset Type RADIOGRAPHIC UNITS: MOBILE First Assigned Technician
Model DRX-REVOLUTION Additional Assignee List
Scheduled Maintenance VISN 2 FLX- Not High Risk Preventive Maintenanc Initiation Reason Scheduled Work Project

Work Order Summary Not High Risk Preventive Maintenance for Model: DRX-REVOLUTION - Annual
Brief Description

Problem Cause Preventive Maintenance Scheduled Start Time 06/01/2023 10:00:00
Resolution Code Pass Service Complete Date 07/28/2023 15:36:08
Resolution Detail Preventive Maintenance: Preventive Maintenance: Pass:
Attach Service Records or Test Procedures and Results:
Completed by Vendor

Asset Details Customer Details Additional Resolution Details Details Financial Schedule Vendor

Manufacturer CARESTREAM HEALTH INC Networked
Serial Number 2243 Software Version Number
Owning Department 528A6-532BH-NURSING HOME CARE UNIT Last PM (Non-Deferred) 06/03/2024 10:53:13
Status In Use Under Contract?
Operational Status Operational Next Scheduled Maintenance 06/01/2025 10:00:00

Signature Pad

Related Links
Show SLA Timeline

Parts/Services (2) Contract Coverage Work Order History (19) Next PM Due (1) Hazard/Recall Alert Checklist Data Related OIT Incidents Related OIT Requests Cerner - Remedy Approvers Test Equipment

Related Knowledge Work Order SLA (4) Attachments Asset Utilization Clinical Work Order Tasks

Amount Search Actions on selected rows... New

Work Order = CWKDD0128064

Number	Amount	Summary	Work Duration	Type	Technician
WOITC7264708	\$45.05	Completed by Vendor: PM times/Maintenanc...	1 Hour	Labor	
WOITC7264809	\$0.00	Completed by Vendor: PM times/Maintenanc...	4 Hours 30 Minutes	Labor	

1 to 2 of 2

C-800 Checklist Example

- This checklist was built from the manufacturer service manual inspection checklist.
- NCPS checklist (National Requirement) in the past has not been attached to work orders. Using the checklist makes it not possible to miss any requirements when doing the PM.
- There has been a significant time reduction going from Paper NCPS form to built in checklists.
- Any values resulting in "Fail" prompts for elaboration.

Parts/Services (1)	Contract Coverage	Work Order History (6)	Next PM Due (1)	Hazard/Recall Alert	Checklist Data (22)	Related OIT Incidents	Related OIT Requests	Cerner - Remedy	Approvers	Test Equipment
Related Knowledge	Work Order SLA (4)	Attachments	Asset Utilization	Clinical Work Order Tasks						
Work Order = CWK0555602										
Number	Checklist rule details	QUESTION Text	Value	Created	Created by					
VERD0552016	Hanidcare INC. C-800 PM Checklist	STRUCTURE: Perform a visual inspection L...	Pass	06/29/2024 17:43:30						
VERD0552017	Hanidcare INC. C-800 PM Checklist	STRUCTURE: Perform a visual inspection L...	Pass	06/29/2024 17:43:30						
VERD0552018	Hanidcare INC. C-800 PM Checklist	STRUCTURE: Perform a visual inspection L...	Pass	06/29/2024 17:43:30						
VERD0552019	Hanidcare INC. C-800 PM Checklist	Rails/Tracks and End Stops: Verification...	Pass	06/29/2024 17:43:30						
VERD0552020	Hanidcare INC. C-800 PM Checklist	Rails/Tracks and End Stops: Ensure that ...	Pass	06/29/2024 17:43:31						
VERD0552021	Hanidcare INC. C-800 PM Checklist	Rails/Tracks and End Stops: Confirm track...	Pass	06/29/2024 17:43:31						
VERD0552022	Hanidcare INC. C-800 PM Checklist	Rails/Tracks and End Stops: Verification...	Pass	06/29/2024 17:43:31						
VERD0552023	Hanidcare INC. C-800 PM Checklist	Lift Unit and Staps: Inspection of lift ...	Pass	06/29/2024 17:43:31						
VERD0552024	Hanidcare INC. C-800 PM Checklist	Lift Unit and Staps: Verification that L...	Pass	06/29/2024 17:43:31						
VERD0552025	Hanidcare INC. C-800 PM Checklist	Lift Unit And Straps: Inspection and act...	Pass	06/29/2024 17:43:33						
VERD0552026	Hanidcare INC. C-800 PM Checklist	Lift Unit And Straps: Confirm any and al...	Pass	06/29/2024 17:43:33						
VERD0552027	Hanidcare INC. C-800 PM Checklist	Lift Unit And Straps: Inspection and ver...	Pass	06/29/2024 17:43:33						
VERD0552028	Hanidcare INC. C-800 PM Checklist	Lift Unit And Straps: Full extension and...	Pass	06/29/2024 17:43:33						
VERD0552029	Hanidcare INC. C-800 PM Checklist	Lift Unit And Straps: Inspection of spre...	Pass	06/29/2024 17:43:33						
VERD0552030	Hanidcare INC. C-800 PM Checklist	Load Testing: Verification of any "soft ...	Pass	06/29/2024 17:43:34						
VERD0552031	Hanidcare INC. C-800 PM Checklist	Load Testing: Verification of load testi...	Pass	06/29/2024 17:43:34						
VERD0552032	Hanidcare INC. C-800 PM Checklist	Load Testing: Verification of any "soft ...	Pass	06/29/2024 17:43:34						
VERD0552033	Hanidcare INC. C-800 PM Checklist	Load Testing: Verification of function o...	Pass	06/29/2024 17:43:34						
VERD0552034	Hanidcare INC. C-800 PM Checklist	Load Testing: Verification of emergency ...	Pass	06/29/2024 17:43:34						
VERD0552035	Hanidcare INC. C-800 PM Checklist	Inspector: After the activities listed L...	Pass	06/29/2024 17:43:34						
VERD0552036	Hanidcare INC. C-800 PM Checklist	VA Representative: After the activities ...	Pass	06/29/2024 17:43:35						
VERD0552037	Hanidcare INC. C-800 PM Checklist	Manager of the Service Using the Ceiling...	Pass	06/29/2024 17:43:35						

Centrifuge Checklist Example

Parts/Services (1)	Contract Coverage	Work Order History (2)	Next PM Due (1)	Hazard/Recall Alert	Checklist Data (5)	Related OIT Incidents	Related OIT Requests	Cerner - Remedy	Approvers	Test Equipment
Related Knowledge	Work Order SLA (5)	Attachments	Asset Utilization	Clinical Work Order Tasks						
≡ ▾ Number Search @ - Actions on selected rows... ▾										
Work Order = CWKD0772553										
<input type="checkbox"/>	Number	Checklist rule details	Question Text	Value						
	VERD0613667	VISN 2 - Centrifuge Checklist	Manufacturer Expected Time and Toleranc...	Expected Time(s): 600 secs (10 mins), ±...						
	VERD0613668	VISN 2 - Centrifuge Checklist	Time Result(s):	600 secs (10 mins)						
	VERD0613669	VISN 2 - Centrifuge Checklist	Manufacturer Expected Speed and Toleran...	Expected Speed(s): 5000 RPM, ± 10 %						
	VERD0613670	VISN 2 - Centrifuge Checklist	Speed Result(s):	5000 RPM						
	VERD0613671	VISN 2 - Centrifuge Checklist	Time Result(s) and/or Speed Result(s) - ...	Pass						
« < 1 to 5 of 5 > »										

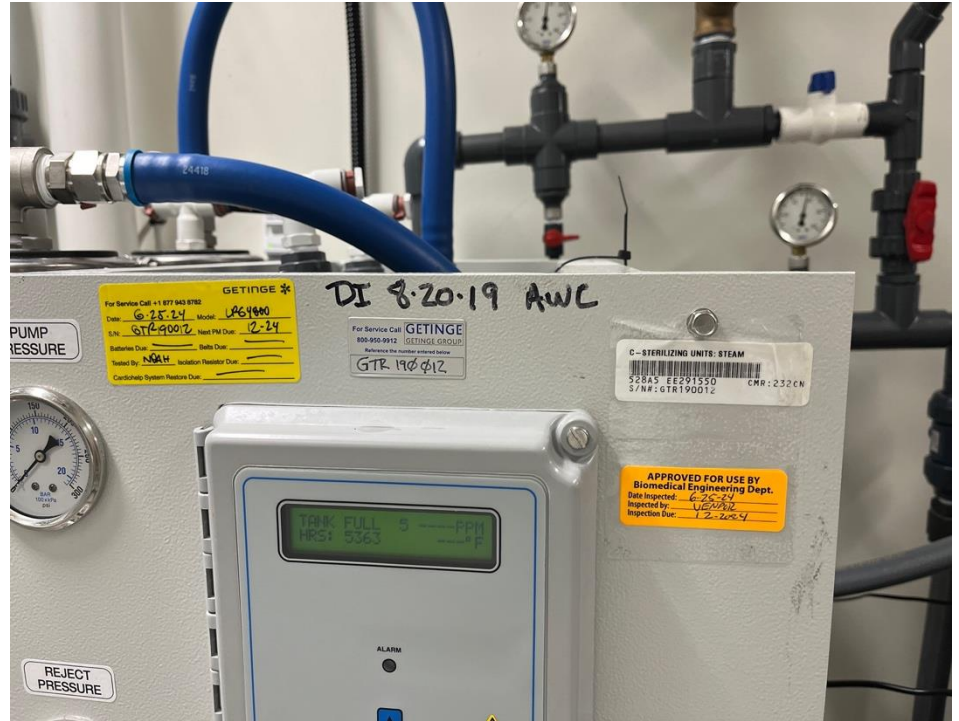
- Required documented results on Blood Bank Centrifuges per AABB
- Ensures this requirement is not being overlooked.
- Marked Failed prompts for further details.

QA PM checklist

Number	Checklist rule details	Question Text	Value	Created	Created by
VERD0513843	HTM - QA - PM Checklist	Indicate Work Order #	CWKD0423688	04/25/2024 11:57:16	
VERD0513844	HTM - QA - PM Checklist	Label Updated?	Yes	04/25/2024 11:57:16	
VERD0513845	HTM - QA - PM Checklist	Label Visible?	Yes	04/25/2024 11:57:16	
VERD0513846	HTM - QA - PM Checklist	Appropriate Label	Yes	04/25/2024 11:57:16	
VERD0513847	HTM - QA - PM Checklist	Case Cleanliness	Yes	04/25/2024 11:57:17	
VERD0513848	HTM - QA - PM Checklist	Old Label removed?	Yes	04/25/2024 11:57:17	
VERD0513849	HTM - QA - PM Checklist	Current Frequency	Yes	04/25/2024 11:57:17	
VERD0513850	HTM - QA - PM Checklist	Was Preventability Determination Accurat...	Yes	04/25/2024 11:57:17	
VERD0513851	HTM - QA - PM Checklist	If Preventable Selected, was Explanation...	NA	04/25/2024 11:57:17	
VERD0513852	HTM - QA - PM Checklist	WO Notes and WO Audit Log Adequate and A...	Yes	04/25/2024 11:57:18	
VERD0513853	HTM - QA - PM Checklist	Appropriate Procedures	Yes	04/25/2024 11:57:18	
VERD0513854	HTM - QA - PM Checklist	Documented Procedures	Yes	04/25/2024 11:57:18	
VERD0513855	HTM - QA - PM Checklist	Bar Label Applied?	Yes	04/25/2024 11:57:18	
VERD0513856	HTM - QA - PM Checklist	Resolution details documented appropriately	Yes	04/25/2024 11:57:18	
VERD0513857	HTM - QA - PM Checklist	If Networked, "Networked" Checked Approp...	NA	04/25/2024 11:57:18	
VERD0513858	HTM - QA - PM Checklist	If Networked, SMAK Enabled?	NA	04/25/2024 11:57:18	
VERD0513859	HTM - QA - PM Checklist	If Networked, vulnerabilities patched?	NA	04/25/2024 11:57:19	
VERD0513860	HTM - QA - PM Checklist	List Deficiencies	NA	04/25/2024 11:57:19	
VERD0513861	HTM - QA - PM Checklist	If Networked, AV installed and patched?	NA	04/25/2024 11:57:19	
VERD0513862	HTM - QA - PM Checklist	Comments (use to explain responses above...	NA	04/25/2024 11:57:19	

Checklists – Wrong Eq. Category

- Example of an RO unit with the equipment category being incorrect.
- Was caught on a QA PM checklist.
- Updated CMMS to reflect correct category.
- Could result in incorrect PM generation.



Checklists – Missing HTM sticker

- Example of an Ultra sonic cleaner missing HTM inspection sticker.
- Vendor completed PM.
- Tech responsible was on leave that day and missed the sticker.
- Issue was caught on a QA PM work order.



Audit your Checklists

- Collaborate with your team to assess your current process around scheduled maintenance. Ask: “Is our process still fit for the purpose in the new tool?”
- Check your current checklists or inspections. Are they being executed and managed correctly?
- Evaluate Checklist generation

Checklist Bypass Issues

- Checklist trigger defect where checklist will not trigger if you add resolution code and move to pending documentation in the same step
- Set up monitor to determine where checklists did not fire
- Workaround solution: If a work order is currently open, but past work in progress and the checklist did not open, a copy can be created to force the checklist generation. The defect WO duplicate can be canceled.

Closed	Working Checklist Status	Clinical Work Orders Count	Percentage of Count
	N/A	81	14.29%
Mar/2024	Pending	1	0.18%
	Completed	485	85.54%
Apr/2024	N/A	39	4.76%
	Completed	780	95.24%
May/2024	Completed	809	100%
June/2024	Completed	1,081	100%

Thank you for attending!

Questions and Discussion

