

Implementing QATrack+ QC Database for Report Generation and Data Analysis

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Background

- Current medical physics survey reports in many departments are saved as Excel and pdf files.
- Large amounts of time and effort are required to extract the information from years of Excel data to perform desired data analysis.
- Integrating an online data base and automated report generation system may reduce unintended missed surveys and the multiplatform (computer/tablet/smartphone) functionality will be useful providing access to and comparing to prior year's results



QATrack+

- A free and open-source online form-based data-entry and database application that can be used to store data in the cloud or dedicated server.
- Customizable to build and define tests.
- Built in review & approval functionality for QC data.
- Multiple user groups with specific permissions for each group.
- Built in scheduling system and email notification to avoid missed surveys
- Built in data trending capability to detect yearly performance changes or to compare performance between different units



All QC

Showing 1 to 5 of 5 entries

Actions Test List/Cycle

Due Date

Perform	Annual_portable x-ray	1 Jun 2021
Perform	Annual_portable x-ray	3 Jun 2021
Perform	Annual Portable C-Arm (OEC 9900)	13 Aug 2021
Perform	Fluoroscopic Shielding and Protection (portable)	25 May 2021
Perform	Input Phosphor Exposure Rate of Fluoroscopy	Not Due

Group Membership & Permissions

Use the controls below to set group permissions and control group members

Group: Students ▾ Add Group

- Qualified Medical Physicists
- Residents
- Students

Use the icons/links below to toggle the permission

Admin Permissions for Students

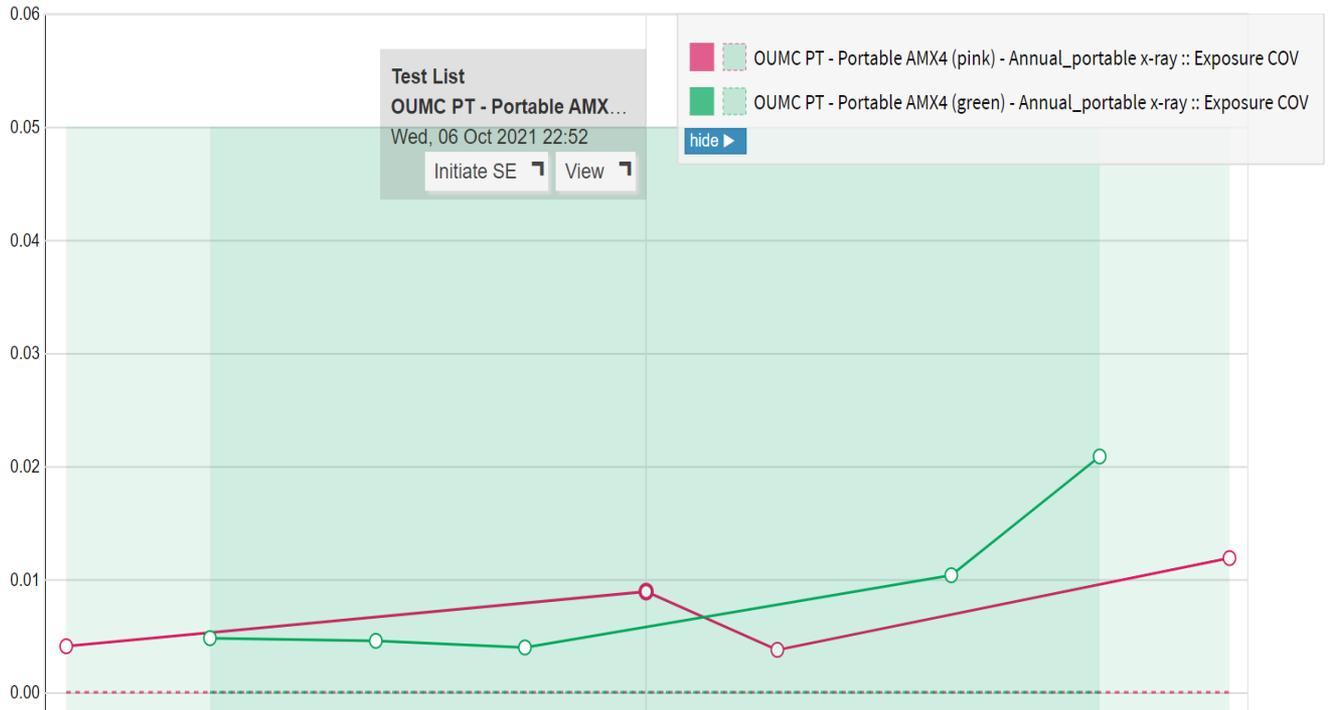
✖ **Can change groups** Allow user to change group permissions

Use the icons/links below to toggle the permission

Performing Permissions for Students

- ✖ **Can add test list instance** Allow user to perform test lists and continue in-p
- ✔ **Choose QC by frequency or category** Allows user to pre-emptively filter te. frequency or category.
- ✔ **Can view refs and tols** Makes reference and tolerance values visible when j
- ✔ **Can view test history** Makes test history visible when performing a test list.
- ✖ **Can skip without comment** Allow a user to skip tests with adding a comm
- ✖ **Can override date** Allow a user to override the work_completed data
- ✔ **Can perform subset of tests** Allow a user to filter tests to perform based or.
- ✖ **Can edit prior test results** Allow a user to edit already completed test resu
- ✔ **Can save test lists in progress** Can save test lists with the 'In Progress' fla

Annual	Illuminance	195.67	<input type="checkbox"/>	✔ OK(22.3%)
Annual	Dial Dimensions Parallel	20	<input type="checkbox"/>	✔ OK(0.0%)
Annual	Dial Dimensions Perpendicular	20.5	<input type="checkbox"/>	✔ OK(2.5%)
Annual	Light Field @ Table (cm) Parallel	20.0000	<input type="checkbox"/>	○ NO TOL
Annual	Light Field @ Table (cm) perpendicular	20.0000	<input type="checkbox"/>	○ NO TOL
Annual	Radiation Field (cm) Parallel	19.75	<input type="checkbox"/>	✔ OK(-1.3%)
Annual	Radiation Field (cm) Perpendicular	20	<input type="checkbox"/>	✔ OK(0.0%)
Annual	Overhead SID Indication - Present	<input type="radio"/> No <input checked="" type="radio"/> Yes	<input type="checkbox"/>	○ NO TOL
Annual	Overhead SID Indication - Accurate	<input type="radio"/> No <input checked="" type="radio"/> Yes	<input type="checkbox"/>	○ NO TOL
Annual	10 mAs	79	<input type="checkbox"/>	✔ OK(-1.3%)
Annual	20 mAs	79.1	<input type="checkbox"/>	✔ OK(-1.1%)
Annual	50 mAs	78.9	<input type="checkbox"/>	✔ OK(-1.4%)
Annual	0 filtration_1 (Exposure)	600.6	<input type="checkbox"/>	○ NO TOL
Annual	>1/2 Output (mm Al)	3	<input type="checkbox"/>	○ NO TOL
Annual	>1/2 Output (Exposure)	313.4	<input type="checkbox"/>	○ NO TOL
Annual	<1/2 Output (mm Al)	3.5	<input type="checkbox"/>	○ NO TOL
Annual	<1/2 output (Exposure)	284.6	<input type="checkbox"/>	○ NO TOL
Annual	0 filtration_2 (Exposure)	599.8	<input type="checkbox"/>	○ NO TOL
Annual	HVL (mm Al)	3.2249302	<input type="checkbox"/>	○ NO TOL
Annual	10 mAs (Linearity)	121.1	<input type="checkbox"/>	○ NO TOL
Annual	25 mAs (linearity)	303.4	<input type="checkbox"/>	○ NO TOL
Annual	50 mAs (linearity)	600.6	<input type="checkbox"/>	○ NO TOL
Annual	100 mAs (linearity)	1200	<input type="checkbox"/>	○ NO TOL
Annual	Exposure COV	5.6823005e-3	<input type="checkbox"/>	✔ OK(0.01)



Method

- Utilize QATrack+ server for server based data storage and analysis.
 - Develop diagnostic imaging report structures within QATrack+ for each modality (ie. Portable x-ray, c-arm, CT, mammography, etc).
 - Current QATrack+ structures are focused on therapy physics record applications and not well suited to diagnostic records
- Create bridge from QATrack+ server to current standard reports (Excel/PDF) – Medical Physics Reports+ (MPR+)
 - MPR+ is a python-based GUI program created to convert information from the QATrack+ database to Excel-like spreadsheets (LibreOffice Calc)
 - Data from server are placed into LibreOffice Calc templates through the QATrack+ API and the appy.pod package functionality
- Workflow including QATrack+, LibreOffice Calc templates and MPR+ is developed to apply/integrate server report record information into professional reports, consistent with current standards

Appy.pod developer:
Gaetan Delannay
(<https://appyframe.work/>)



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MP Reports+ OUHSC Interface

Options

Search **Review**

Choose start search date: **1** 9/9/2020 **2**

Choose end search date: 9/9/2021

Available Sites: OUMC **3**

Unit Types: Portable X-ray **4**

Available Units: OUMC PT - Portable AMX4 (pink) **5**

Available Records: 14 - Annual_portable x-ray - 06/03/2021 **6**

Review Options

Variable/Slug Name	Show Item in Review	Order in Review	Readable Name	Low Tolerance Bound	High Tolerance Bound	Precision
leakage_limit	<input type="checkbox"/>					
ese_limit	<input type="checkbox"/>					
exp_repro_mas_lin	<input type="checkbox"/>					
hvl_acc	<input checked="" type="checkbox"/>	2	HVLOK?			
kvp_acc	<input checked="" type="checkbox"/>	1	kVp OK?			
misalign_xray_light	<input type="checkbox"/>					
operator_exposure	<input type="checkbox"/>					
leakage_pe_hr	<input type="checkbox"/>					
leakage_pc	<input type="checkbox"/>					
leakage_p_hr	<input type="checkbox"/>			0.0	100.0	

SURVEY & ACCEPTANCE TEST: MOBILE RADIOGRAPHIC UNIT

Unit: unit_info_dict.get('name',) Physicists: user_dict[created_by].get('name') Date: nit_info_dict.get('test_date')

GEID: user_dict[modified_by].get('name')

Reviewed By: user_dict[reviewed_by].get('name'); File was not n

Equipment: GE AMX+4 XFMR

Manufacturer	Model Number	Serial Number	Date of Manufacture
Console: _value_dict.get('console_')			
Tube: value_dict[Tube Info].get('value_dict[Tube Info].get('value_dict[Tube Info].get('dev_value_dict[Tube Info].get('date',')			
Collimator: value_dict[Collimator].get('value_dict[Collimator].get('value_dict[Collimator].get('dev_value_dict[Collimator].get('date',')			

diographic Shielding and Protection:

	YES	NO	Calcs:
Audible "On" Indication:		x	value_dict.get('audible_alarm',)
Visible "On" Indication:		x	value_dict.get('Visible_alarm',)
Dead Man Exposure Switch:		x	value_dict.get('dead_man_switch',)
Operator can make exposures at 6' or farther away from source:		x	value_dict.get('exposure_switch_location',)
kVp and mAs Indication:		x	value_dict.get('kvp_mas_indication',)

Template Assistant

Value/String Value | Devices | Unit Info | User Info | Comments

device_key	info_key	value
Collimator		
vendor		MedysSPA
model		46-270615
serial		MDYS9123
date		Sep-15
Tube Info		

diographic Unit Assembly Evaluation:

	YES	NO	
Tube		x	value_dict.get('tube_assembly_evaluation',)
Unit		x	value_dict.get('tube_lock_evaluation',)
Comments:			value_dict.get('unit_drive_breaks',)

diographic Collimation and SID:

Collimation @ : _dict.get('s' " SID

	==
Dial Dimensions (cm):	dial_dimensions_parallel,
Light Field @ Table (cm):	get('light_field_parallel',)
Radiation Field (cm):	get('radiation_field_parallel',)

Comments:

	YES	NO
Overhead SID Indication		
Present		
Accurate		

Comments:

Measured Radiographic X-Ray Tube Voltage (80 kVp Nominal):

Results

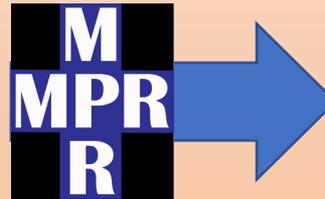
- Investigation of the online system provides a customizable selection for testing requirements. Many individual tests can be re-used or modified for multiple modalities or survey types.
- Built-in functionality allows statistical analysis for survey testing results.
- Surveys are reviewed and approved by appropriate groups on the server/database, and the QATrack+ API is successfully used to access or export data.
- MPR+ bridges data extraction from the server and provides information in a customizable template driven format for report generation.
- The data was organized and placed in LibreOffice Calc utilizing an appropriate template
- The final report nearly identical to current practice forms (Excel spreadsheets) is produced and can be accessed using LibreOffice exported to Excel



QA Track+
(Server/cloud based
data entry and analysis)

OUHSC Physics		Perform QC	Review QC	Service Log
Dial Dimensions Parallel	19.5			
Dial Dimensions Perpendicular	20			
Light Field @ Table (cm) Parallel	20			
Light Field @ Table (cm) perpendicular	20			
Radiation Field (cm) Parallel	20			
Radiation Field (cm) Perpendicular	19			
Overhead SID Indication - Present	Yes			
Overhead SID Indication - Accurate	Yes			
10 mAs	82.3			
20 mAs	82.4			
50 mAs	82.5			
0 filtration_1 (Exposure)	924			
>1/2 Output (mm Al)	2.5			
>1/2 Output (Exposure)	488.4			
<1/2 Output (mm Al)	3			
<1/2 output (Exposure)	445.2			
0 filtration_2 (Exposure)	922.3			
HVL (mm Al)	2.805			
10 mAs (Linearity)	183			
25 mAs (linearity)	460.3			

MP Reports+
(Python based
app
for data
selection and
template
formation)



Final report from
template in Excel-like
(spreadsheet) format

SURVEY & ACCEPTANCE TEST: MOBILE RADIOGRAPHIC UNIT					
Unit:	UMC PT - Portable AMX4 (prt)	Physicists:	M. Yang	Date:	06/03/2021
GEID:			M. Yang		
1. Equipment					
	GE AMX+4 XFMR				
	Manufacturer	Model Number	Serial Number	Date of Manufacture	
Console:	GE	2275938-9	136065TX0	Nov-13	
Tube:	MedysSPA	46-270615	MDYS9123	Sep-15	
Collimator:					
2. Radiographic Shielding and Protection:					
			YES	NO	
	Audible "On" Indication:	x			
	Visible "On" Indication:	x			
	Dead Man Exposure Switch:	x			
	Operator can make exposures at 6' or farther away from source:	x			
	kVp and mAs Indication:	x			
3. Radiographic Unit Assembly Evaluation:					
			YES	NO	
Tube	Movements Acceptable:	x			
	Locks Acceptable:	x			
Unit	Drive Acceptable:	x			
	Breaks Functioning:	x			
Comments:					
4. Radiographic Collimation and SID:					
	Collimation @	40	" SID		==
			Dial Dimensions (cm):	19.50	
	Illuminance:	238.645 LUX	Light Field @ Table (cm):	20	
			Radiation Field (cm):	20	
Comments:					
			YES	NO	
Overhead SID Indication		Present			
		Accurate			
Comments:					
5. Measured Radiographic X-Ray Tube Voltage (80 kVp Nominal):					
mAs	10	20	50	Mean kVp	% variance
kVp	82.3	82.4	82.5	82.4	0.10%
Comments:					
6. Radiographic Half Value Layer (80 kVp):					
Filtration (mm of Al)	0.0	2.5	3.0	0.0	HVL (mm Al):



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Conclusion

- The marriage of these technologies provides an achievable full diagnostic survey handling system.
- Having an online multiplatform database allows access to data at anytime from anywhere.
- The added functionality to extract the data and automate the report generation process may improve efficiency of the medical physicists' workflow.
- Current standards for final report formatting is maintained and may be generalized or unified for many units
- Provides an opportunity for (more) efficient future data analysis tasks on image quality, dose or other relevant parameters

