Implementation of Risk Assessment Tool for the Standardization of Training Methodology and Learning Assessments of Standard Operating Procedures in a Pharmaceutical Plant

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Abstract *— The Food and Drug Administration requires that pharmaceutical companies submit to regular on-site inspections and product monitoring, and that they reveal the methods used in clinical trials proving drug efficacy. Thorough these companies are implementing Risk-Based approaches to quality. This focuses on higher elements, while reducing non-value activities. In addition companies are implementing lean approaches to minimize waste. One critical element are Standard Operating Procedures (SOP), which are the basic working instructions on how the employees will manufacture a drug product. SOPs are critical to efficient operations, quality control, and regulatory compliance. Beyond the written procedure, SOP compliance includes a requirement to train employees on essential job tasks. It is critical that employees who are performing Good manufacturing Practices (GMPs) tasks have received the relevant training via training method that ensures effective learning transfer. This project has been developed under the Quality Risk Management Model to develop and implement a tool for the Standardization of Training Methodology and Learning Assessments of SOPs in a Pharmaceutical Plant, in order to establish a standard process to determining the appropriate training methodology and assessment and identify and eliminate non-value-added training activities.*

Key Terms *— Evaluation, Pharmaceutical Industry, Quality Risk Management, Standard Operating Procedures, Training Methodology.*

PROJECT STATEMENT

The executions of Standard Operating Procedures (SOPs), which are working instructions, in a pharmaceutical operation are critical tasks to be performed by workers to guarantee a finished product with the required quality attributes. Due to high number of SOPs in the plant, there is a huge amount of training and learning process to be delivered. These SOPs are constantly revised. This situation has caused a lack of standardization and consistency in training process in determining what will be the methodology and learning assessment used for the training of each SOP across the pharmaceutical plant.

Research Description

This project has been outlined with the purpose of analyze and evaluate the current training methodology and evaluation for SOPs to make it standard, reliable, and compliant. An SOP is used to ensure business processes are well thought, which each task in a process is performed the same way every time, and important data is recorded, along with errors or deviations so corrective action can be taken. Workers that are not properly trained can raise non-conformances due to human performance.

Research Objectives

The objectives of the research work can be outlined in the following:

- Establish a standard process to determining the appropriate training methodology and assessment through the use of a Risk Based approach tool;
- Identify and eliminate non-value-added training activities.

Research Contributions

With the implementation of this project is expected to result in better use of resources to

deliver value added activities, and in the same way, learning culture will be focused on what is important and it is expected a decrease of errors or deviations because of human performance errors.

BACKGROUND

The development and manufacturing of a pharmaceutical product is complex, expensive and involves the interaction of many systems. These characteristics are the result in part of all of a large number of regulatory requirements.

The pharmaceutical and biotech environment today is changing quickly due to globalization, increased competition, cost constraints, demands for efficiency, development of international regulation, supply chain complexity, and product/process complexity.

It is critical that all workers who are performing Good manufacturing Practices (GMPs) tasks have received the relevant training via training method that ensures effective learning transfer. Mainly, Standard Operation Procedures (SOP's) are the foundation documents or basic instructions used by workers to do their job tasks.

SOP's are critical to efficient operations, quality control, and regulatory compliance. The purpose of an SOP is straightforward: to ensure that essential job tasks are performed correctly, consistently, and in conformance with internally approved procedures. It is clear that the performance of employees directly impacts the quality of the product and therefore the business results. By its nature, poor employee performance has a negative impact on overall operational performance. That impact may be even greater than recognized by many organizations, with some studies suggesting that up to 40% of operational inefficiencies can be attributed to employees' failure to fulfill their job responsibilities [1]. Every year, the Food and Drug Administration (FDA) issues 483's and Warning Letters to pharmaceutical, medical device and biologics companies. Many companies' violations center on failure to have, or to properly use, SOPs, the most fundamental component of the GMPs. Although different regulations apply to each of the life sciences sectors, SOP compliance is required for all companies within those business areas.

Ensuring comprehension must be a goal of any company that wants to avoid problems with the regulatory agencies, and furthermore, a company that wants to obtain a safe, effective and quality product. Today, the standard of SOP compliance requires that SOPs be applied. "Failure to follow written procedures" occurs frequently in FDA's 483s, suggesting that employees neither understood nor applied the necessary knowledge to properly fulfill their job responsibilities. Interestingly, many of these violations occur in companies compliant with basic SOP requirements related to written procedures, and distribution and validation of employee receipt and understanding of the SOP. Yet, those same companies often lack a mechanism to confirm comprehension. All SOP programs should incorporate testing or evaluation features that clearly establish an employee's level of comprehension for any individual SOP.

Training programs should not, however, be developed merely to satisfy government regulations. Employees must have the knowledge and skills to perform the necessary job functions to achieve the company's goals. Changes in technology, equipment and procedures, organizational focus, and other areas require that training be a continuous and standardized process and not just one-time occurrence for new employees.

From a compliance perspective, it is critical that all employees who are performing GMP tasks have received the relevant training via a training method that ensures effective learning transfer. For example, a complex task that has recently had significant changes in procedure should be designed as a training event that has the active presence of a trainer and includes practice and demonstration of competence. Similarly, if the task has a significant impact to product quality / process integrity if completed incorrectly, there should be a learning assessment that checks weather each

individual has the correct learning to be able to perform the GMP task.

From a business perspective it is important that training is aligned with business goals and objectives and delivers the business results efficiently with maximum impact. For example, requiring all to be learnt via a classroom method with a mandatory set of questions that must be completed by all learners is not necessary the most efficient training method or learning assessment for simple training where there are minimal learning needs with little impact (i.e., simple changes to an SOP for a non-critical GMP task may not require training) [2].

From an employee perspective it is vital that at the end of a training event they have the necessary learning / skill to be confident and competent in completing the related GMP tasks independently. This means that the training method and learning assessment needs to be aligned with the true need for learning so that the employee engages with the content and can link and apply the new knowledge or skill to their existing knowledge, job task and improve performance.

Decisions about Training methodology and learning assessments can be made through the use of the Quality Risk Management (QRM) process.

QRM is a systematic process for the assessment, control, communication and review of risks to the quality of the drug product across the product lifecycle. [3] Two primary principles of quality risk are:

- The evaluation of the risk to quality should be based on scientific knowledge and ultimately link to the protection of the patient and;
- The levels of effort, formality, and documentation of the quality risk management process should be commensurate with the level of risk.

With the use of QRM, a formal process can be reached to ensure consistency in the decision making and could improve the process understanding. Also, will allow confronting quality key quality questions like; what is acceptable? What is the most important? What is the most value added?

METHODOLOGY

In order to achieve the proposed objectives, this section provides an overview of the process and methodology that will be applied in the design project. The process to be used is in alignment with the Quality Risk Management Model, as established by the International Conference of Harmonization (ICH Q9) Guidelines. See Figure 1 below.

Figure 1
Risk Management Process

The following 9 steps approach will be followed to develop and implement a Risk Assessment Tool for the standardization of training methodology and evaluation of Standard Operating Procedures;

- **Step 1: Collect and Organize Information** – For SOP topics, a list will be generated of all current SOPs with their current training format/methodology and learning assessment. Identify if there are currently differences in how these SOPs are trained on initially and for retraining (e.g. by instructor, self-study, On the Job Training (OJT), Computer Based Training (CBT)). For other training, list all current courses with their current training format / methodology. Tools which can be used to organize available information: Plots or

Graphs, Brainstorming, Statistical tools, Flow Charting, Process Mapping.

- **Step 2**: **Formulate Risk Question** - Risk Assessment consists of the identification of hazards and the analysis and evaluation of risks associated with the exposure to those hazards. Quality risk assessments begin with a well-defined risk question. Three fundamental questions to be used will be: 1) what might go wrong? 2) What is the likelihood (probability) it will go wrong? 3) What are the consequences (severity)?
- **Step 3: Choose Tool**: Some tools that might be used in QRM are [3]:
  - Basic Risk Management Facilitation Methods; used to structure risk management by organizing data and facilitating decision-making. For example, some of them are; flowcharts check sheets, process mapping, and cause and effect diagrams.
  - Failure Mode Effects Analysis (FMEA): FMEA provides for an evaluation of potential failure modes for processes and their likely effect on outcomes and/or product performance. Once failure modes are established, risk reduction can be used to eliminate, contain, reduce or control the potential failure.
  - Fault Tree Analysis (FTA): Is an approach that assumes failure of the functionality of a product or process. This tool evaluates system (or sub-system) failures one at a time but can combine multiple causes of failure by identifying casual chains.
  - Risk Ranking and Filtering (RRF): Is a tool for comparing and ranking risks. Risk ranking of complex systems typically requires evaluation of multiple diverse quantitative and qualitative factors for each risk. The tool involves breaking down a basic risk question into as many components as needed to capture factors involved in the risk.
- **Step 4: Identify Risk Factors / Hazards** - For the Risk Factors (patient safety, compliance and business) identify all potential hazards arising from each scenario. For hazards, identify the sources of potential harm related to each risk factor.
- **Step 5**: **Define Scales and Risk Components** - In this step, it should be defined the differentiations in the potential Consequences and Harms related to each risk component. The definition should incorporate potential hazards related to each identified Risk Factor. A minimum of 3 levels established for each Risk Component (Severity, Probability and Detection - if Detection is applicable). Risk Evaluation involves multiplication of the Component elements, therefore, be careful when using the number 0 (zero), because 0 X 0 = 0 and differentiation is lost. Different scales can be used:
  - Linear: 1, 2, 3, 4;
  - Exponential: 1, 2, 4, 8;
  - Logarithmic: 1, 10, 100, 1000;
  - Self-made: 1, 3, 7, 10;
  - High, Medium, Low

  The potential consequences related to each risk Component should incorporate potential hazards related to each identified risk factor and its related hazard. If available, historical information and data should be used to define the consequences to understand potential outcomes. The following are the risk components:
  - Severity: what are the consequences? For example, Impact that an event may have on patient, compliance or business.
  - Probability: what is the likelihood it will go wrong? Probability of occurrence of harm.
  - Detection: the ability to detect the harm
- **Step 6: Determine Action Thresholds** - A level or value above which an action will take place and below which it will not. Examples of Action Thresholds:

- We do something or we do not.
- Unacceptable: Risk is unacceptable; must be reduced.
- Acceptable: Always accept the risk; we take the risk considering cost/benefit.

- **Step 7: Apply Tool** – Apply to plant SOPs according to the scope of the implementation
- **Step 8**: **Define Risk Reduction** – Risk reduction focuses on processes for mitigation or avoidance of quality risk when it exceeds a specified (acceptable) level. Risk reduction might include actions taken to mitigate the severity and probability of harm. Processes that improve the detectability of hazards and quality risks might also be used as part of a risk control strategy.
- **Step 9 –Document and communicate Output/Results** – In this step, the output / result of the quality risk management process should be appropriate communicated and documented.

RESULTS AND DISCUSSION

This chapter presents the results and analysis of the 9 steps methodology to develop and implement a Risk Assessment Tool for the Standardization of Training Methodology and Evaluation of Standard Operating Procedures.

Collect and Organize Information

In order to quantify total numbers of SOP to be evaluated by the Risk Based Analysis (RBA) tool, a query in the plant documentation system was performed resulting in a total of 686 documents. However, not all procedures will be evaluated by the tool because only the procedures classified in the system as GMP are in the scope of this implementation. From the total of the 686 procedures, there are 85 that are classified as Non-GMP. Environmental, Health and Safety (EHS) SOPs are usually classified as Non-GMP, because the scope of them is focused on safety issues instead of quality of a pharmaceutical product. Therefore, the final number of procedures to be evaluated by the RBA tool is 601 SOPs. Table #1 summarizes the overall panorama of all procedures governing the pharmaceutical plant operation. SOPs are divided by area of operation with their current training methodology and learning assessment.

Table 1
SOPs Current Training Methodology and Learning Assessments

SOP Quantities	Area	Training Methodology / Learning assessment
47	Engineering	None
145	Laboratory Operations	None
30	Logistics	None
20	Technical Services	None
134	Packaging Operations	4 SOP with SOJT
130	Manufacturing Operations	77 SOPs with SOJT
73	Quality Assurance Operations	None
22	Quality Control Operations	2 SOPs with SOJT
601	**Total**	

From the total of 601 procedures, 77 of Manufacturing Operations, 4 of Packaging Operations, and 2 of Quality Control have a predefined training methodology and learning assessments. This methodology and assessments were developed using the training approach known as SOJT. These 81 SOPs were included as part of an improvement project identified during an inspection to develop structured methodology. SOJT is a systematic process of providing trainees with the knowledge and skills required to perform a specific task within their job. The trainee demonstrates knowledge and practical skills under supervision of a trainer for the task being trained. Besides the 81 procedures covered by the SOJT methodology, the other procedures are not covered by a specific method to train and learning assessment. For the other 520 GMP procedures, training methodology and training effectiveness was vaguely covered in the site training SOP. It only provided a suggested guideline to be followed by trainers when delivering SOP and overall trainings as described in Table # 2. The guideline

was based on 4 basic levels to be used by trainers to evaluate the effectiveness of training.

The problem is that the guideline does not set a specific standard to trainers in which training methodology to be followed and the type of learning assessments to be provided. The instructions are open and practically no training methodology is followed nor learning assessments performed. The methodology and assessments to be used rests with the decision of each trainer and/or author of procedures, which implies a lack of standardization and lack of specific criteria to decide which is the most appropriate training methodology and learning assessment. This lack of standardization reveals aspects such as; what will be methodology and evaluation to be used for initial trainings, or for SOP revisions with major changes or minor changes.

Table 2
Levels of Training Effectiveness

Level I Reaction – It measures the effectiveness of training in relation to participant satisfaction. A questionnaire can be used.	**Level II Learning** – measures whether the learning objectives were achieved. Written tests, verbal, simulations, quizzes, demonstrations, and case studies can be used.
Level III Behavior – measures whether the transferred trained in compliance with the expectations, knowledge and skill to the work area. You can use direct observation of performance and checklists.	**Level IV Results** - determines the operational impact as a result of learning. Metrics, data or business results can be used

A part of the data gathering step, an 'as-is' flowchart of the training process was built before the implementation of the RBA. This process flow confirmed the lack of direction in terms of training format and learning assessments to be delivered.

As part of the phase of collecting data and organizing information comes out that the scope of this implementation is extensive due to the large number of procedures to be evaluated by the RBA tool. A known fact is that the revision of a single procedure has an average life cycle of 30 days, since it begins with a draft, it is reviewed, approved, training is provided and is effective. In order to achieve a practical breakthrough that does not impact operations, the tool must be implemented beginning with a pilot plan. The pilot plan will include only the procedures to be reviewed by periodic review of three years and new procedures.

Formulate Risk Question

From a compliance perspective, it is critical that all employees who are performing GMP tasks have received the relevant training via a training method that ensures effective learning transfer. On the other hand, from a business perspective it is important that training is aligned with business goals and objectives and delivers the business results efficiently with maximum impact. Finally, from an employee perspective it is vital that at the end of a training event they have the necessary learning / skill to be confident and competent in completing the related GMP tasks independently. After considering all these perspectives, and in order to clearly define the initial risk question or issue the following question was formulated: What is the appropriate decision for Training Methodology and Learning Assessment that ensures that employee competence and site compliance (product quality and regulatory compliance) are maintained?

Choose Tool

To identify the appropriate decision for training methodology and learning assessment, the FMEA- 'Failure Mode Effect Analysis tool' is the most appropriate to use. FMEA allows assessing the potential failure for the process and the possible impact on the results or performance of the product mode. When the mode of failure is established you can use risk reduction to eliminate, reduce or control the potential failure. It depends on the understanding of the products and processes. Risk assessment for training is based on the potential impact of a failure in following a procedure. The severity of the impact and the possibility of

detection are key aspects in the decision-making process. This approach builds on the methodology of FMEA.

Identify Risk Factors / Hazards

To identify the appropriate decision for training methodology and learning assessment, the FMEA- 'Failure Mode Effect Analysis tool' is the most appropriate t

Based on the risk question formulated previously in section titled 'Formulate Risk Question' the potential harms associated with each potential risk were identified;

- Probability – Likelihood of ineffective/ insufficient learning transfer (employee may not have required level of knowledge, skill or attitude at the end of the training)
- Impact/Severity – Impact of ineffective/ insufficient learning transfer on the employee's competence and thus product quality and compliance
- Detectability – Ability to detect if the severity has occurred

Define Scales and Risk Components

Table #3 summarizes the defined scales and risk components.

Table 3
Description of Scales and Risk Components

Probability			
High- 3	Expected to occur		
Medium – 2	Might Occur		
Low -1	Not Expected to occur		
Impact / severity	**Business**	**Customer**	**Compliance / Quality**
High – 3	Unable to produce	Product defective or unavailable, high customer dissatisfaction	Significant impact/severity resulting in harmful, recalled, or extensively rejected product
Medium – 2	Lose batch(s) but can resume production	Minor product defects or delays, some customer dissatisfaction	Impacts and would result in a recordable or investigate event
Low-1	None or brief production delay, no loss	Little or no customer impact/severity or dissatisfaction	Insignificant or no impact severity; not expected to be recordable
Detectability			
High – 3	Not expected to detect		
Medium – 2	Might detect		
Low – 1	Expected to detect		

Determine Action Thresholds

The following summarizes the levels of risks;

- **Low Risk**: All risk components are 1
- **Medium Risk**: Worst Impact/Severity=2 + Probability=1 or 2 + Detectability= 1 or 2 Or Worst Impact/Severity is 2
- **High Risk**: Any Impact/Severity is 3; Or Impact/Severity=2 and Probability=2 and Detectability=3; Or Impact/Severity=2 and Probability=3

It is described in table #4 the actions to be taken on the level of risk that the training / learning event presents. By taking actions to implement the appropriate training methodology and using the appropriate learning assessment, an effective action is taken to mitigate or minimize the identified risk. In order to build the right action threshold, it is defined first the following terms:

- Initial Training: Employee learning a topic/task for the first time
- Minor SOP Revision: No significant content change (e.g. Typographical, editorial revisions, grammar, organizational re-naming, etc.). No training is required. Waiver can be applied.
- Major SOP Revision: Significant change to content / skill / competency, may be complex or non-complex to learn.

It is important to note that a distinction between exempt and nonexempt employees is made. The non-exempt employees are mostly operators of production and packaging areas. To ensure that learning is most effective, always it is required for this type of employee to be trained by a certified instructor. The operators usually are not necessarily previously experienced in pharmaceutical production environment. It is required in the FDA Code of Federal Regulations (CFRs) in section 211. 25; 'Each person engaged in the manufacture, processing, packing, or holding of a drug product shall have education, training, and experience, or any combination thereof, to enable that person to perform the assigned functions the organization'. Therefore, for personnel without

experience, the organization is responsible to deliver the appropriate training to ensure an effective learning process is achieved.

Table 4
Trainings on SOPs

Risk	When	Methodology	Learning Assessment
Low	Initial training	Exempt employees - Self-Directed learning with read and understand instruction or CBT Non-exempt employees- Classroom training or small group training by Instructor or guided Interactive CBT	No Assessment
	Major Revision	Exempts- Self-Directed learning with read and understand instruction or CBT Non-exempts - Classroom training or small group training by Instructor or documented general documentation	No Assessment
Medium	Initial training	Exempts- Self-Directed learning with read and understand instruction or CBT Non-exempts - Classroom training or small group training by Instructor	Level 2 Learning Assessment
	Major Revision	Exempts- Self-Directed learning with read and understand instruction or CBT Non-exempts - Classroom training or small group training by Instructor	Level 2 Learning Assessment
High	Initial training	Structured On-the Job Training, Interactive CBT	Level 2 +Level 3 Learning Assessment
	Major Revision	Structured On-the Job Training, Interactive CBT	Level 2 +Level 3 Learning Assessment if competency is modified

In the column of 'Learning Assessment' of table # 4, for SOPs categorized as medium or high risk, level 2 and level 3 tools are assigned for learning Assessments. In table # 5 are defined the options for ensuring assess learning.

In order to implement and apply the Risk-Based-Analysis tool it was required to revise the existing procedure of the training program of the pharmaceutical plant. All the corresponding personnel were trained in a workshop, explaining them step by step on how to use the tool. In Figure # 2, is described the new process flow built to make feasible the implementation.

Table 5
Level 2 and Level 3 Tools for Learning Assessments

Options for Level 2 Learning Assessments (Checking Knowledge / attitude / awareness):	Options for Level 3 Learning Assessments (Checking skill / competence):
• Multiple-choice test • True/false test • Matching definitions with wording • Recall a process, rules, method • Quote procedure • Explain a scenario /work on a case study • Suggest reaction or solution to a problem • Create examples • Explain a theory • Solve a problem / identify solutions • Identify constituent parts and functions of a process or concept • Develop plan or procedures • Preparing summary or presentation	• Use of SOJT -Observe and replicate task -Reproduce activity from instruction or memory -Execute skill independently and consistently

Apply Tool

The highlights of the new SOP are:

- Scope of the RBA implementation is for SOPs with 3 periodic review years and new SOPs.
- A guideline for generation of Learning Assessment was included.
- Results of the RBA are summarized in a Training Strategy document. This document has to be approved and monitored by quality training personnel to ensure the completion of the strategy.
- For self-study strategy, on-line learning assessments will be configured in the Learning Management System (LMS).

The decision to pilot this implementation for new SOPs and their periodic review is based on the complexity of the operations plant, is not only the fact o+f applying a tool to procedures, is which comes once we get the results and risk. If an SOP is categorized as medium risk, then it implies that the author have to create learning assessments, or redesign trainings. If an SOP is categorized as high risk, implies the creation of learning assessments, but also the creation of a Structured on-The Job Trainings. Periodic reviews of procedures allow predicting and projecting the workload in the medium and long term, so in this way there is enough time beforehand to start using the tool.

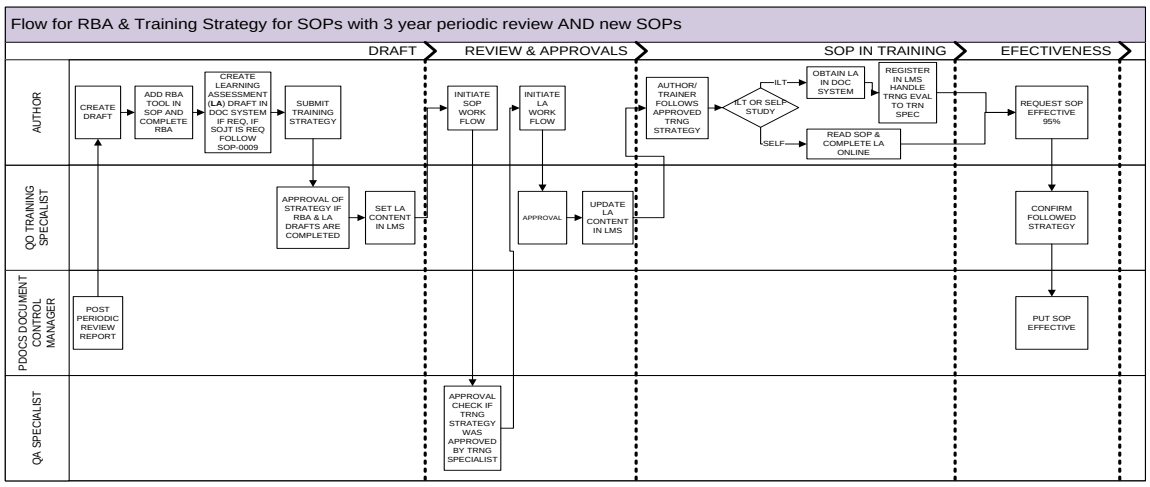

Figure 2

Flow for RBA & Training Strategy for SOPs with 3 Year Periodic Review AND New SOPs

In conjunction with the FMEA approach developed in sections titled 'Define Scales and Risk Components' and 'Determine Action Thresholds an Excel' a Spreadsheet was developed to facilitate the use of the RBA. Refer to Figure #3.

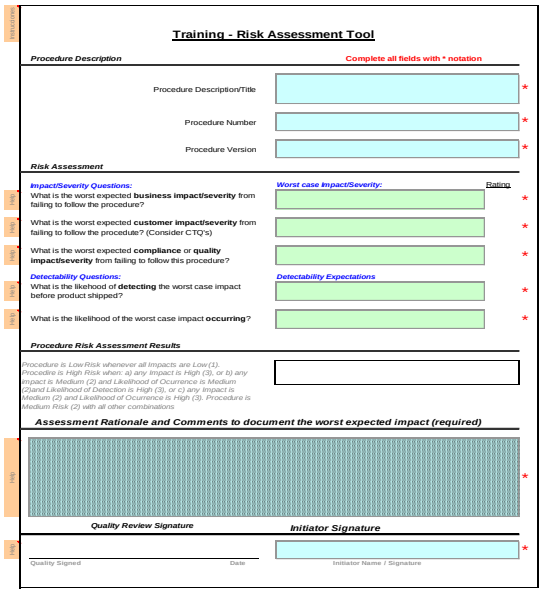

Figure 3

Risk Assessment Tool

The RBA tool was applied to new SOPs and for those in their periodic review from the months of January to April, as was estimated in the project schedule. A total of 21 SOPs were evaluated by the risk assessment tool, 15 of them were revised by their corresponding periodic review of three years, and the other 6 were new SOPs. In Table #6 are the detailed results of the RBA and the corresponding Training Strategy. As a summary of the results of the SOP risk categorization can be highlighted in Figure # 4.

Given these results, then it was proceeded with the second phase of the implementation, which involves redesign of trainings and building learning assessments as proposed in Table 3, where the training methodology and the way that learning is evaluated is determined. For the 9 procedures classified as 'high risk', learning assessments were developed, in other word, theoretical exams, and also were developed SOJTs. For the 6 SOPs classified as 'medium risk', learning assessments were developed. For the remaining procedures classified as 'low risk' no assessments were developed, but training methodology was determined. For low risk SOPs, Instructor Lead Training sessions are required for non-exempt employee and exempt employees can self-study

Define Risk Reduction

There are number of ways to use this approach to mitigate/minimize risk in relation to training methodology and learning assessments. In general the approach can be used:

- Reactively, whenever there is a new or revised SOP or when designing a new training course.
- Proactively, when implementing a project to review all SOPs or training items and define

the appropriate training methodology and learning assessment, e.g., at time of implementing a LMS and setting up items.

Table 6

Detailed RBA Results and Training Strategy

Month	RBA Reason	SOP Code	SOP Title / Topic	RBA Result	Training Strategy SS=Self-study LA=Learning Assessment ILT=Instructor Lead Training SOJT=Structured On-The Job training	
					When	Methodology / Assessment
Jan	Periodic Review	LAB-0254	OPERATION OF ION CHROMATOGRAPHY SYSTEM	MEDIUM	Initial Training	Exempts: SS +online LA Non-Exempts: ILT + LA
					Major Revision	Exempts: SS +online LA Non-Exempts: ILT + LA
Feb	Periodic Review	ENG-118	ALISIS DE AGUA EN EL AREA DE UTILIDAD	LOW	Initial Training	Exempts: SS Non-Exempts: ILT
					Major Revision	Exempts: SS Non-Exempts: ILT
	New	ENG-0018	Preventive Maintenance Program	MEDIUM	Initial Training	Exempts: SS +online LA Non-Exempts: ILT + LA
					Major Revision	Exempts: SS +online LA Non-Exempts: ILT + LA
	New	ENG-0019	Maintenance Work Order Control	LOW	Initial Training	Exempts: SS Non-Exempts: ILT
					Major Revision	Exempts: SS Non-Exempts: ILT
	New	ENG-0020	CMMS Business Continuity Plan	LOW	Initial Training	Exempts: SS Non-Exempts: ILT
					Major Revision	Exempts: SS Non-Exempts: ILT
	New	ENG-0022	Remove from Service Guidelines for Objects in the Preventive Maintenance Program	MEDIUM	Initial Training	Exempts: SS +online LA Non-Exempts: ILT + LA
					Major Revision	Exempts: SS +online LA Non-Exempts: ILT + LA
	Periodic Review	MTN-176	MANEJO DE PAÑOS, ACEITES USADOS Y AEROSOLES	HIGH	Initial Training	ILT + LA + SOJT
					Major Revision	ILT + LA + SOJT if competency change
	Periodic Review	LAB-179	SOLUTION STABILITY DETERMINATION	LOW	Initial Training	Exempts: SS Non-Exempts: ILT
					Major Revision	Exempts: SS Non-Exempts: ILT
	Periodic Review	PKG-0366	DESMONTAJE, LIMPIEZA Y AJUSTES DE LA LLENADORA	HIGH	Initial Training	ILT + LA + SOJT
					Major Revision	ILT + LA + SOJT if competency change
Mar	Periodic Review	ENG-0006	ntrol Systems Administrative Guidelin	MEDIUM	Initial Training	Exempts: SS +online LA Non-Exempts: ILT + LA
					Major Revision	Exempts: SS +online LA Non-Exempts: ILT + LA
	Periodic Review	PKG-0394	CESE DE OPERACIONES EN LAS LINEAS DE EMPAQUE	HIGH	Initial Training	ILT + LA + SOJT
					Major Revision	ILT + LA + SOJT if competency change
	Periodic Review	PRO-0268	OPERACION Y LIMPIEZA DEL VERTICAL CONVEYOR	HIGH	Initial Training	ILT + LA + SOJT
					Major Revision	ILT + LA + SOJT if competency change
	New	PKG-0052	Proceso de Serializacion en las Lineas de Empaque	MEDIUM	Initial Training	Exempts: SS +online LA Non-Exempts: ILT + LA
					Major Revision	Exempts: SS +online LA Non-Exempts: ILT + LA
	Periodic Review	PRO-0006	OPERACION Y LIMPIEZA DEL MOLINO	HIGH	Initial Training	ILT + LA + SOJT
					Major Revision	ILT + LA + SOJT if competency change
	Periodic Review	PRO-0021	OPERACION DEL INDICADOR DIGITAL	HIGH	Initial Training	ILT + LA + SOJT
					Major Revision	ILT + LA + SOJT if competency change
	Periodic Review	QA-004	EGISTRO MAESTRO DE FIRMAS E INICIALE	LOW	Initial Training	Exempts: SS Non-Exempts: ILT
					Major Revision	Exempts: SS Non-Exempts: ILT
Apr	Periodic Review	LAB-0262	Operation and Verification of the Colorimeter	MEDIUM	Initial Training	Exempts: SS +online LA Non-Exempts: ILT + LA
					Major Revision	Exempts: SS +online LA Non-Exempts: ILT + LA
	New	PKG-0054	y Limpieza del Drum Inverter en Empa	LOW	Initial Training	Exempts: SS Non-Exempts: ILT
					Major Revision	Exempts: SS Non-Exempts: ILT
	Periodic Review	PKG-0372	OPERACION Y LIMPIEZA DE LA CARTONER	HIGH	Initial Training	ILT + LA + SOJT
					Major Revision	ILT + LA + SOJT if competency change
	Periodic Review	PKG-295	ERACION Y LIMPIEZA DE LAS CARTONERA	HIGH	Initial Training	ILT + LA + SOJT
					Major Revision	ILT + LA + SOJT if competency change
	Periodic Review	PKG-0018	Operacion, Montaje, Ajuste y Limpieza Maquina Neumatica para Secar Cepillos-Lineas de Botellas	HIGH	Initial Training	ILT + LA + SOJT
					Major Revision	ILT + LA + SOJT if competency change

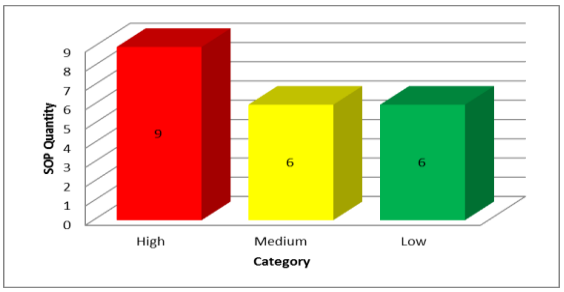

Figure 4

Summary of Results of the SOP Risk Categorization

For this implementation, the reactively approach was used, since the categorized SOPs were new and revised due to their periodic review. In this way a projection can be made of what will be the workload and then properly allocate human resources and decide when to start working with the tool.

Document and communicate Output/Results

All the implementation and progress were documented and communicated using the appropriate and official electronic systems. For example, implementation of the RBA caused the revision of the Training Program SOP. Once, an SOP is revised, the electronic documentation system and the learning management system send communications to employees having this SOP in their curricula. Also, multiple training sessions were offered to all affected personnel. As part of the information provided in the training, the implementation of the risk assessment tool was communicated. Once all training sessions were delivered, SOP was made effective on January. In addition, a whole year projection was published and sent to all the authors of SOPs, considered Subject Matter Experts (SME) who are the ones performing the RBAs and carry out the corresponding actions according to the risk results. One the authors start the process and apply the tool, a constant communication is required between the Quality Training Specialists and the Document Control Administrator to ensure all the required steps are followed according to the effective SOP. Part of the action items that need to be performed are; the appropriate design of learning evaluations, the appropriate design of SOJTs, the correct online configurations of the assessments. Finally, it is essential to ensure that the training strategy was fulfilled.

CONCLUSIONS

After a three months period, the implementation of the pilot program of the RBA has resulted in a desired output. Although the complete implementation of the tool will be completed in a mid-term period, two major benefits had been gained, first the standardization of

training methodology and learning assessments of SOPs in the pharmaceutical plant, resulting in a standard process to determine the appropriate training methodology and learning assessments and in turn identify and eliminate non-value-added training activities. For example, 'High Risk' SOPs are usually related to equipment, systems, and processes that are product contact and have a direct impact in the quality attributes of the product, such as product integrity, safety and identity. Therefore, the best way to achieve an effective learning for this kind of SOP is through the use of a structured training, such as on-the Job Training format. The active presence of a trainer and includes practice and demonstration of competence. In the other hand, the 'Medium Risk' SOPs are less critical, but a failure in following the SOP could cause delays and events in the production. Finally, "Low Risk' SOPs are usually related to administrative systems or processes that have a low impact in product quality attributes. When properly identified, low risks SOPs will reduce the extra effort in developing additional training requirements. Then, the resources can be assigned and focus to work with the 'High' and 'Medium Risk' SOPs. The second benefit is a consequence of the first; while a robust learning system is implemented it will benefit the output and overall performance of the plant. When employees have all the knowledge and appropriate skills then human error would be down resulting in less defective product and best performance.

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