Checklists (2022)

Robert Sheffield, CHT and Kevin I. "Kip" Posey, CHT / January 2022

The concept of a checklist is at the heart of a hyperbaric safety program. Of all the safety tools to minimize risk in our facilities, the checklist is probably the most obvious, simple, powerful, and underutilized tool. Although we use various forms of checklists in our daily lives, getting people to properly implement checklists in our hyperbaric facilities might be one of our greatest challenges.

OBJECTIVES

At the completion of this activity, the participant will be able to:

- Identify appropriate pause points in their operation
- Identify three factors leading to missed paused points
- List three elements of a good checklist

INTRODUCTION

In the process of researching this article, one reference dominates any search for information about checklists. *The Checklist Manifesto: How to Get Things Right*, authored by surgeon Atul Gawande, is a must-read. Dr. Gawande was part of the World Health Organization (WHO) effort to create a safe surgery checklist that could be implemented anywhere. He shares numerous real-world examples of how checklists have measurably improved outcomes in medicine and in many other fields of endeavor. It includes important checklist lessons learned from the aviation, construction, venture capital and restaurant industries (and even from the band Van Halen). It is a short, easy read; and although this article borrows heavily from Manifesto, you should read it for yourself.

WHAT IS A CHECKLIST?

That might seem like a silly question because everyone in the hyperbaric field should be acquainted with a pre-treatment safety checklist. However, checklists come in a variety of forms and cover a variety of topics, ranging from trivial to lifesaving. Examples include:

- Grocery list
- To-do list
- Calendar appointment/reminder on your phone
- Aircraft pilot pre-flight checklist
- Medication checklist (i.e., right patient, right drug, right dose, right route, right time)
- Surgery time-out

When you read the list above, did one or more of the examples make you think, "That's not a checklist"? Most of us probably think a checklist must be a written document, with check boxes next to each item. Unfortunately, this perception narrows our point of view and may prejudice us against broader use of checklists. The purpose of a checklist is not to tick boxes on a form. Although you may have documentation requirements to satisfy Medicare or The Joint Commission, the checklist itself is not meant to be a documentation exercise. The common thread of all checklists is having a physical, written reminder to do/verify something. A checklist is a tool to ensure we do not miss important aspects of a procedure.

With routine tasks we have performed many times, being distracted or rushed may cause us to miss something. Even without these factors, our memory can fail us, but a written reminder can't − as long as we pay attention to it. One of the most important and challenging things about checklists is adopting the process. Adopting the process is very much a team effort (rather than an individual one) and may require institutional change. The excerpt below is from Manifesto:

> "Practitioners have had the means to measure vital signs since the early twentieth century, ... But although using four signs together as a group gauged the condition of patients more accurately than using any of them singly, clinicians did not reliably record them all.
>
> ...Faulty memory and distraction are a particular danger ... whether running to the store to buy ingredients for a cake, preparing an airplane for takeoff, or evaluating a sick person in the hospital, if you miss just one key thing, you might as well not have made the effort at all.
>
> ...Checklists seem to provide protection against such failures. They remind us of the minimum necessary steps and make them explicit. They not only offer the possibility of verification but also instill a kind of discipline of higher performance. Which is precisely what happened with vital signs - though it was not doctors who deserved the credit.
>
> The routine recording of the four vital signs did not become the norm in Western hospitals until the 1960s, when nurses embraced the idea. They designed their patient charts and forms to include the [vital] signs, essentially creating a checklist for themselves.
>
> With all the things nurses had to do for their patients over the course of a day or night - dispense their medications, dress their wounds, troubleshoot problems - the 'vitals chart' provided a way of ensuring ... they didn't forget to check their patient's pulse, blood pressure, temperature, and respiration and assess exactly how the patient was doing."[1]

The nurses in the excerpt above created a checklist tool within their documentation. In the era of paper documentation, hyperbaric facilities created forms with check boxes or prompts to remind us of necessary documentation. This practice has carried over into our current electronic documentation. These documentation reminders in our forms are a helpful checklist tool. However, they blur the distinction between checklists and documentation; and can mislead us into designing our checklist tools to meet our documentation requirements.

There is a regulatory incentive to adopt checklists in healthcare. The Joint Commission requires use of a checklist in their survey probe UP.01.01.01 EP 2.

> "EP 2 requires a standardized pre-procedure verification list of items that, at a minimum, are - or may be required - at the time of the operative or invasive procedure. ... Working from a standardized verification list reduces variability and thus the potential for error ... for example ... a pre-procedure checklist ..."[4]

Most hyperbaric departments have applied this process in the form of a pre-treatment safety checklist, however many are not using the checklist properly.

The Difference Between a Checklist and Documentation

In healthcare, we must have comprehensive documentation to satisfy regulatory and reimbursement agencies. This can make it difficult to separate the concept of a checklist from our documentation requirements. In many of our minds, the checklist <u>is</u> a form of documentation, but it should not be. We have detailed written policies and procedures to explain what we are supposed to do. Then we have some form of written documentation, attesting we actually did it. The checklist fits between the two. It should be a tool for completing the procedure correctly, rather than documentation of the procedure. This distinction frees us to design more user friendly checklist tools, outside the constraints of our documentation requirements.

SO WHY DON'T WE USE CHECKLISTS PROPERLY?

It would be easy to think the problem is laziness or a lack of diligence. Although those particular human factors might be in play, there are other human factors and significant workflow factors affecting the proper use of checklists. Some people resist using a checklist because they believe it will be difficult to use, take too long, or will not improve safety. None of these are true if the checklist is well designed. The bigger challenge is embracing the checklist concept and using it consistently and diligently. This may require a cultural shift within the department or organization. The cases discussed in this article are all real-world examples.

Case 1: WHO safe surgery checklist. To refute the notion checklists do not improve safety, Case 1 is an excerpt from *Manifesto*. In 2008, the WHO conducted a pilot study of a safe surgery checklist in eight hospitals around the world.

> "Four [hospitals] were in high-income countries and among the leading hospitals in the world... Four were intensely busy hospitals in low- or middle-income countries... Annual health care spending in the high-income countries reached thousands of dollars per person, while in [three of the low-income countries], it did not rise above the double digits... On one end of the spectrum were those with state-of-the-art capabilities ... On the other end were hospitals forced by lack of staff and resources to prioritize urgent operations ... Even when hospitals did the same operation ... the conditions were so disparate that the procedures were the same in name only. In poorer hospitals, the equipment was meager, the teams' training was more limited, and the patients usually arrived sicker ...
>
> We collected data on the surgical care in up to four operating rooms at each facility for about three months before the checklist went into effect. ... Of the close to four thousand adult surgical patients we followed, more than four hundred developed major complications resulting from surgery. Fifty-six of them died. About half the complications involved infections. Another quarter involved technical failures that required a return trip to the operating room to stop bleeding or repair a problem. The overall complication rates ranged from 6 percent to 21 percent.
>
> ...We tracked performance of six specific safety steps ... These are basics... Nevertheless, we found gaps everywhere. The very best missed at least one of these minimum steps 6 percent of the time − once in every sixteen patients. And on average, the [eight] hospitals missed one of them in a startling two-thirds of patients, whether in rich countries or poor.
>
> Then, starting in spring 2008, the pilot hospitals began implementing our two-minute, nineteen-step surgery checklist. ... The final results showed that the rate of major complications for surgical procedures in all eight hospitals fell by 36 percent after introduction of the checklist. Deaths fell 47 percent. ...Infections fell by almost half. The number of patients having to return to the operating room after their original operations because of bleeding or other technical problems fell by one-fourth. Overall, in this group of nearly 4000 patients, 435 would have been expected to develop serious complications based on our earlier observation data. But instead just 277 did. Using the checklist had spared more than 150 people from harm − and 27 of them from death.
>
> ...Perhaps the most revealing information ... was simply what the staff told us. More than 250 staff members − surgeons, anesthesiologists, nurses, and others − filled out an anonymous survey after three months of using the checklist. In the beginning, most had been skeptical. But by the end, 80 percent reported that the checklist was easy to use, did not take a long time to complete, and had improved the safety of care. And 78 percent actually observed the checklist to have prevented an error in the operating room. ... Nonetheless, some skepticism persisted. After all, 20 percent did not find it easy to use, thought it took too long, and felt it had not improved the safety of care."[1]

For a checklist to be successful the concept must be embraced and there must be commitment to making its proper use a habit.

What is "Workflow"?

"A workflow consists of an orchestrated and repeatable pattern of activity, enabled by the systematic organization of resources into processes that transform materials, provide services, or process information. It can be depicted as a sequence of operations … or the work of a person or group." [5] *Think about all of the tasks performed, where they happen, and who is involved in them from the time a patient is referred for hyperbaric treatment until the patient is discharged from the hyperbaric service. This can be viewed as one large workflow, consisting of smaller workflows. The daily treatment of a hyperbaric patient is a workflow, including everything that happens to the patient or because of the patient. To truly understand this workflow, we must think about all the individual tasks, their sequence, and specifically how they are executed.*

Case 2: Hospital-based monoplace facility.

> The hospital staff in this facility are accustomed to an electronic health record (EHR); and have not used any paper documentation in many years. When the new hyperbaric department is added, they are provided a paper checklist for the pre-treatment safety check but will not use it. Checklists had not been part of their workflow. They consider the pre-treatment safety checklist a piece of documentation and insert it into documentation step of their workflow, instead of making it part of the procedure.

The staff in Case 2 had developed a habit of performing tasks (without a checklist in hand), then documenting them later. It takes significant effort and diligence to break this habit.

Case 3: Hospital-based multiplace facility.

> In this facility, the morning start-up requires 73 specific actions/verifications to ensure operational readiness. Staff turnover is low, so most of the staff have worked with this same equipment for many years. Most of the staff perform the start-up from memory, without using the written start-up checklist that is readily available. Some of them carry the laminated checklist with them during the start-up, but never actually look at it.

In Case 3, the checklist is taken for a walk, but isn't being utilized properly. Why? Perhaps the start-up checklist is too long (or perceived to take too much time). If the start-up was divided into several shorter checklists, it might be more palatable. It might feel unnecessary to refer to the checklist, especially when we have confidence from performing the same task frequently. Also, one might feel pride in being able to memorize the procedure. The people who created this checklist are likely to feel confident in their ability to remember the procedure. One might be insulted by the idea we need a checklist − as if we are not smart enough to do it without a reminder. A very wise hyperbaric safety director once said, "People who use a checklist properly don't look stupid. They look really smart to me."

The Psychology of Habits

"A habit is a routine of behavior that tends to be subconscious. When behaviors are repeated in a consistent context (i.e., setting or situation), there is an incremental increase in the psychological link between the context and the behavior." [2] *Think about hyperbaric patients for a moment. They answer "no, no, no" to the same series of safety questions day after day. Each day, they are strengthening the psychological link between the situation (i.e., the safety checklist) and answering "no, no, no". At some point, they go on auto-pilot; and are not even thinking about your questions anymore. Their behavior has become automatic. It is common knowledge that habits (i.e., automatic behaviors) are hard to change. The psychological reason behind this difficulty is the profoundly strong link between the situation and the behavior. Once we develop a habit (whether it is the patient automatically answering "no" or the hyperbaric staff performing a safety check from memory), the behavior is no longer intentional, we are not aware we are doing it, and it is very difficult not to do it.*

THE PAUSE POINT

The most important concept in checklist utilization is the **pause point** - a moment in time when we must verify certain things are in place/correct before we proceed. Another way to define a pause point is the moment just before it is too late. Properly applying a checklist at the pause point would minimize the frequency of missing something before it is too late. The Joint Commission recognizes a pre-procedure pause point in survey probe EP3.

> "EP 3 is the process of comparing information about the patient and procedure with the items identified in EP 2 that are required to proceed with the procedure. The final verification process generally occurs before the patient leaves the pre-procedure area or enters the procedure room. Missing information, supplies or discrepancies are addressed before starting the procedure."[4]

The Hyperbaric Facilities chapter of the NFPA Health Care Facilities Code recognizes the pause point "prior to each hyperbaric treatment" in the Hyperbaric Facilities chapter:

> "14.3.1.6.1.3 Prior to each hyperbaric treatment, a pretreatment safety check … shall be performed …"[3]

> "14.3.1.6.8 Clothing worn by patients ... in Class A or Class B chambers … shall, prior to each treatment, conform to the following… They shall be devoid of prohibited articles prior to chamber pressurization."[3]

One of the most common checklist utilization mistakes in hyperbaric medicine is missing the pause point. Case 4: Hospital-based monoplace facility.

> In this facility (like the facility in Case 2), the pre-treatment safety check is performed from memory. Then the patient is loaded into the chamber and treatment begins. At some point during the treatment, completion of the pre-treatment checklist is documented in the EHR. The checklist is not actually applied (i.e., the reminder is not in front of us) until after the pause point has passed.

In Case 4 (and in many other hyperbaric facilities), the staff tick all the checklist boxes in the EHR after the pause point has passed. Once the pause point is behind us, especially if there is a delay, there is a good chance we will not recognize a mistake - and the thing we missed is already inside the chamber.

The Workflow Problem with EHRs and Checklists

The way most of us use an EHR (perform one or more tasks, then document them later) contributes to missing pause points. The checklist is meant to be a tool applied at a pause point (typically just before the beginning of a procedure or at a critical point during a procedure). When the checklist is made part of the documentation step of our workflow, the pause point has passed before we look at the checklist. The checklist must be part of the procedure rather than part of the documentation.

Many hyperbaric facilities have included the hyperbaric pre-treatment safety checklist in the EHR; and are having issues with the time stamp. Documentation is time stamped when entered into the EHR. If the pre-treatment safety check is documented after the hyperbaric treatment begins (as in case 4), it appears in the EHR as if the pre-treatment check was performed after the treatment started. This raises a compliance flag. Solving this compliance problem draws focus to the documentation. Regardless of how we resolve documentation issues, we must focus on properly using the checklist tool at the pause point.

Another commonly missed pause point is the pre-treatment medical check. Prior to each hyperbaric treatment, the patient should be medically cleared. This involves one or more of the following: vital signs; lung sounds; examination of tympanic membranes; and medically relevant questions. In many hyperbaric facilities, patient vital signs are collected by the chamber operator, who might be an unlicensed person. At the medical assessment pause point, an appropriate person* should assess whether or not: (1) the treatment can proceed; (2) a treatment modification is necessary; (3) a medical intervention is necessary. This assessment should be repeated (i.e., another pause point) after the treatment, before the patient is allowed to leave. These pause points are missed for a variety of reasons. Contributing factors may include:

- The only staff member in the chamber room throughout the day is a hyperbaric technician (unlicensed person).
- Providers or nurses only see the hyperbaric patient if the hyperbaric technician calls them to do so.
- Local policies include parameters for vital signs. Providers or nurses only assess the hyperbaric patient if something is outside of parameters.
- Providers or nurses only assess the patient if the patient has a complaint.

****Who Can Perform Medical Assessment?***

An appropriate person to perform a medical assessment is someone licensed by the State to do so. This includes a physician, PA, NP, or RN. It may include other licensures, depending on their scope of practice. Individuals certified as MA, CNA, CHT, and CHS (and hyperbaric technicians without a certification) can collect vital signs and other patient data (if competent in the techniques); but are not allowed to make a medical assessment of the data they collect. Vital sign parameters could be a checklist tool for medical assessment. However, parameters should not be a "How-to Perform Medical Assessment" guide for an unlicensed person.

Case 5: Hospital-based monoplace facility.

> Hyperbaric patients are seen by the physician once per week, or whenever there is an issue. The other days of the week, the only staff member the hyperbaric patient sees is a hyperbaric technician. One particular day, the technician is being observed by a surveyor. The technician performs a pre-treatment safety check (properly using a checklist). The technician takes vital signs and blood glucose of the diabetic patient, then loads the patient into the chamber and begins treatment. After

> the patient reached treatment pressure, the surveyor asks, "Do you have set parameters for blood pressure and glucose values?" Technician: "Yes." Surveyor: "What are the parameters?" Technician: "I'm not sure, but I think it is in the department policy book." A pre-treatment safety checklist was properly used and medical information was collected, but the pause point of medical assessment was missed entirely.

In Case 5, the routine workflow did not include input from other team members, thus making it easier to miss the medical assessment pause point. The facility in Case 5 could redesign the workflow to have a provider or nurse review the vital signs of the hyperbaric patient prior to each treatment and prior to sending the patient home after the treatment. This would allow for input from team members other than the hyperbaric technician. Even when the above-recommended workflow is in place, we may still miss the pause point.

Case 6: Hospital based monoplace facility.

> According to department policy, a provider reviews vital signs and sees the hyperbaric patients before and after every treatment. The provider is busy seeing wound care patients elsewhere in the department throughout the day, so the provider must be called to the chamber room to clear hyperbaric patients before and after treatment. There are 5 hyperbaric chambers operated by two hyperbaric technicians each day. Typical hyperbaric patient volume is more than 20 per day. A typical workday for the provider and hyperbaric technicians is at least 11 hours. Frequently, hyperbaric treatments were started and/or patients were released post-treatment without seeing the provider. On several occasions, the provider discovered (after the pause point had passed) the patient should not have been treated and/or allowed to leave without an intervention.

The chamber room in Case 6 is a hectic place. There could be more than eight patients in the room at one time. There is pressure to perform the treatments on schedule, but there are multiple outside factors affecting the treatment schedule. High patient volume, long work hours, a hectic environment, and time pressure make it hard to be diligent about calling and waiting for the provider. Regardless of workflow issues, we must not discount the importance of the pause point.

The Workflow Problem with the Design of Hyperbaric Chamber Rooms

Many hyperbaric chamber rooms are designed as a separate fire zone/compartment with a door that remains closed throughout the day. Any common areas for provider or nurse charting are typically outside the chamber room. In effect, the chamber operator is isolated from the rest of the facility. This physical layout does not foster teamwork. Communication between the chamber operator and other team members cannot happen organically – it must be deliberate. Unless team communication is somehow designed into the workflow, it is unlikely to happen.

Checklists can improve communication among team members. In *Manifesto*, the discussion of the results of the WHO pilot study included the following:

> "In our eight hospitals, we saw improvements in administering antibiotics to reduce infections, in use of oxygen monitoring during operations, in making sure teams had the right patient and right procedure before making an incision. But these particular improvements could not explain why unrelated complications like bleeding fell … We surmised that improved communication was the key. Spot surveys of random staff members coming out of surgery after the checklist was in effect did indeed report a significant increase in the level of communication. There was also a notable correlation between teamwork scores and results for patients – the greater the improvement in teamwork, the greater the drop in complications."[1]

Implementation of the WHO surgery checklist changed the workflow of the operating room, leading to increased communication. Part of the new workflow included a pause point specifically for each team member to state if they had any concerns before proceeding with the surgery.

Before we can build a checklist, we must identify the pause point (the reason for the checklist). Some examples of daily pause points in a hyperbaric facility include:

- Facility start-up. There may be multiple pause points within the daily start-up, depending on the complexity of the facility. However, we should not proceed (i.e., treat patients) unless equipment is in place and functioning

properly (including support equipment and communications), gas supplies are adequate, personal protective equipment and other emergency equipment/supplies are available.

- Pre-treatment patient medical assessment. We should not proceed (treat the patient) unless medically cleared each time.
- Pre-treatment safety check. We should not proceed (treat the patient) unless adequately screened for prohibited items. There may be multiple pause points in this screening, depending on how it is conducted.
- Post-treatment medical assessment. We should screen the patient post-treatment to make sure they are stable.
- Facility shutdown.

In addition to the ones listed above, many multiplace facilities include a pause point to verify the breathing gas before donning breathing devices. At each of these pause points, a checklist can be used to ensure we don't forget something.

Also think about other pause points:

- Weekly chamber maintenance
- Monthly/semi-annual chamber maintenance
- Annual preventive maintenance

Should We Design the Checklist to Fit the Workflow?

No. Although a checklist might disrupt the existing workflow, a common mistake is to make the checklist fit the workflow. The critical issue is to identify a pause point, then design a checklist tool to serve the pause point. The workflow should be designed to ensure we don't miss any pause points.

If the chamber or support equipment is not functioning correctly at any of these maintenance intervals, it could present a risk to patients or staff. Operations should not proceed until the equipment is repaired. For most monoplace chambers, the maintenance procedures are simple and not very time consuming.

Historically, safety standards and many checklist items in hyperbaric medicine were created as a reaction to mishaps and near misses. Rather than wait for a problem to arise, a better approach is to proactively identify pause points. Start by breaking down the workflow into a timeline of individual elements. Then, perform a risk assessment on each element. This should reveal the pause points and if the workflow should be redesigned. When conducting the risk assessment, not all risks have the same severity and not all tasks have the same complexity. Therefore, not all pause points need a checklist. For each pause point you identify, decide if a checklist tool is needed.

DEVELOPING A CHECKLIST

From *Manifesto*:

> "There are good checklists and bad… Bad checklists are vague and imprecise. They are too long; they are hard to use; they are impractical. ... They treat the people using the tools as dumb and try to spell out every single step. They turn people's brains off rather than turn them on.
> Good checklists … are precise. They are efficient, to the point, and easy to use even in the most difficult situations. They do not try to spell out everything … Instead, they provide reminders of only the most critical and important steps – the ones that even the highly skilled professionals using them could miss. Good checklists are, above all, practical.
>
> The power of checklists is limited. … They can help experts remember how to manage a complex process or configure a complex machine. They can make priorities clearer and prompt people to function better as a team. By themselves, however, checklists cannot make anyone follow them."[1]

A checklist is not a training tool. It assumes a level of competency; and serves merely as a reminder of the essential steps. The format and length of checklists will vary depending on the purpose and the urgency of action.

To get started building a checklist in your hyperbaric department, think about emergency procedures. We have a long, detailed, written procedure in our department policy manual. It may list all actions of the chamber operator and actions of other staff as well. This is a necessary document, but not useful in an actual emergency. We don't pull out the policy manual if a patient has a seizure inside the chamber. Instead, we rely on training (i.e., routinely practicing the emergency drill) to make the chamber operator competent at this procedure. Many hyperbaric facilities have

incorporated checklist tools for the chamber operator – a condensed bullet list of emergency actions based on a particular emergency procedure. Because action is urgent, this kind of checklist tool should be immediately accessible, short, and easy to read. It should be a half-sheet of paper (or large index card), with large print, and containing only the essential bullets. It might look something like this:

(Monoplace chamber example)

SEIZURE IN CHAMBER	
• Pressure	(HOLD)

(Multiplace chamber example)

SEIZURE IN CHAMBER	
• Pressure	(HOLD)
• Breathing Gas	(AIR)

The chamber operator may perform several other tasks (e.g., call the provider; document the time), but this short, to the point tool contains only the actions the chamber operator must do to mitigate the situation. Apply the same essential bullets concept to your other hyperbaric emergency procedures. Each checklist tool should include as few bullets as possible. There might be other steps, but only include the critical steps. Other checklists you develop (i.e., not emergency procedures) may be longer, but paring these emergency procedure tools down to the critical steps is good practice for developing checklists in general.

When you are developing a new checklist tool, start by identifying the pause point (the reason for the checklist). Everything you put into the checklist should serve the pause point. Next, write down each task required at this pause point, in the order you would do them. Get input from multiple team members. The staff who will use this checklist need to be involved, but other team members should be included. Then start narrowing the list down to the key elements. As you narrow down the checklist, remember, after about sixty to ninety seconds at a given pause point, the checklist may become a distraction. Also remember you are building a tool for someone who should already know what to do. Focus on the steps that are the most dangerous if skipped.

If you find yourself with a very long checklist (after you have tried to shorten it), consider that you might be looking at more than one pause point. Many of us probably consider the pre-treatment checks we perform as a single pause point. In reality, it is at least two different pause points: pre-treatment medical check, and pre-treatment safety check. The pre-treatment safety check itself could be divided into at least two pause points: the safety check(s) we do minutes before the treatment, and the verification(s) we do seconds before we close the door (e.g., patient ground wire connected, air break assembly connected). Each pause point could have its own checklist.

You must decide the style of your checklist (e.g., READ-DO or DO-CONFIRM). With a READ-DO checklist, team members carry out the tasks as they check them off – more like a recipe. This is the style of checklist most people are familiar with. However, it might be appropriate to use a DO-CONFIRM checklist. Team members perform their jobs from memory and experience, but then they pause to run the checklist and confirm each item on the checklist was properly completed. Think about the reason for the pause point and the type of task(s) involved. This may help inform your decision about the style of the checklist.

How Do Pilots Deal with an Emergency?

Below is an example of an airplane pilot's checklist from Manifesto. It is the emergency procedure for engine failure of a single engine Cessna airplane. The pilot will perform several other actions. This reminder only includes the critical first steps to manage the emergency situation.

ENGINE FAILURE DURING FLIGHT	
• Airspeed	68 KIAS
FLY THE AIRPLANE !	
• Fuel Shutoff Valve	ON (IN)
• Fuel Selector	BOTH
• Auxillary Fuel Pump	ON
• Mixture	RICH
• Ignition Switch	BOTH

"Fly the airplane!" was included in the checklist because sometimes pilots are overcome by simultaneously trying to figure out what went wrong and desperately trying to restart the engine; and they forget to do the most basic thing – control the plane.

Case 7: Hospital-based multiplace facility.

> This facility treats mechanically ventilated patients, but rarely does so – perhaps once per year. The hyperbaric ventilator they use is pneumatically driven and requires an elaborate setup procedure. They develop a checklist tool for setting up the ventilator. The design of the checklist was influenced by the following factors:
>
> - The setup is elaborate (several components must be configured and/or set properly)
> - The setup does not have to be executed urgently (several minutes can be used)
> - None of the staff have significant experience with this procedure
>
> They design a READ-DO checklist, specifying each step in the setup process. Images of the components at each step of the set up were added for clarity.

Once a new checklist is developed, it should be tested by multiple team members and modified/refined as much as possible. Checklists also must be updated in order to keep up with changes in technology. Regarding the pre-treatment safety checklist, prior to the 1990s the therapeutic heat patch (i.e., exothermic warmer) was not commonly used. Prior to the mid-2000s, the e-cigarette did not exist. Today, small wearable medical devices (e.g., glucose monitor) are prevalent.

Consider things we do not personally control. For most of us, our pre-treatment safety check is a verbal check of the patient. We rely on the patient's conscientious participation. There are a variety of circumstances when a verbal check may not be adequate (e.g., patient with dementia, distracted patient). At the end of your pre-treatment safety check, consider adding a pause point with a single checklist item, "Is a physical search necessary?" Also consider adding another pause point just before you close the chamber door. At this point, checklist items could include: "Medically cleared"; "Safety check complete"; and "Any concerns?" (monoplace facilities should include, "Ground wire attached"). The pause points where we ask ourselves if a physical search is necessary and if we have any concerns are meant to force team members to stop and think for a moment, "Is there a reason not to put this patient in the chamber right now?" Hopefully, this will help prevent team members from performing the checklist on autopilot.

A pause point, with the same single checklist item, "Do you have any concerns?" is implied in the pre-treatment medical check. Consider formalizing it and creating a checklist tool for the nurse/provider who assesses the patient. It could look something like this:

- VITALS
- GLUCOSE
- LUNGS
- ANY CONCERNS?

When performing the pre-treatment medical checklist, "Any concerns?" should trigger the nurse/provider to look for a decline in the patient's physical appearance, an altered mental state, or any abnormal findings.

HITS AND NEAR MISSES

Case 8: Hospital-based multiplace facility.

> In this facility, the oxygen percentage in the breathing gas system is sampled at the beginning of each treatment (before it is delivered to patients) as part of a pre-treatment checklist. One day, the sample at the beginning of the first treatment is less than 80%. On the previous afternoon, the liquid oxygen system had been refilled with liquid nitrogen. Treatments were suspended until the oxygen system was restored to pure oxygen. No hyperbaric patients were exposed. The pre-treatment safety check of the gas supply succeeded in preventing a mishap.

Case 9: Hospital-based multiplace facility.

> Several patients are being prepped for a hyperbaric treatment. One of the patients has a negative pressure wound therapy (NPWT) machine (electrical device). It is on the patient bed, underneath a blanket. This device had not been tested or approved for a hyperbaric environment. The bed is loaded into the chamber, with the

> device still connect to the patient. The device was discovered mid-treatment, when it started beeping. It was turned off and removed from the chamber. There was no injury.

The patient in Case 9 was an inpatient and the NPWT device was a newer, smaller design (less obvious under the blanket). The staff member performing the pre-treatment safety check was not aware of the device and did not check under the blanket. Either the checklist tool was inadequate or it was not used properly. Perhaps team communication could be improved and/or the pre-treatment checklist could be modified. Many of us probably assume inpatients are less likely to bring a prohibited item into the chamber. Although the items may differ between inpatients and outpatients, both need a high level of scrutiny.

Case 10: Hospital-based monoplace facility.

> In this facility, the hyperbaric chamber is cleaned after each patient treatment. To clean inside the chamber, the operator lies on the patient bed. During the subsequent patient treatment, the operator cannot find their mobile phone and tries to locate it by calling the mobile number from the hospital phone in the chamber room. The mobile phone is lying inside the hyperbaric chamber, under the patient bed. It had fallen out of the operator's pocket while cleaning the chamber. The treatment was terminated, and the mobile phone removed without a mishap.

In Case 10, the hazard was introduced to the inside of the chamber between treatments and was not discovered prior to starting the next treatment. The pre-treatment safety check of the patient was not adequate to prevent this unsafe condition. Perhaps the cleaning procedure and/or the pre-treatment checklist could be modified.

Case 11: Hospital-based multiplace facility.

> In this facility, a periodic test of the fire suppression deluge system is conducted. During one phase of the test, an isolation valve is closed – preventing water from flowing to the chamber. When the test is complete, the isolation valve was not re-opened. On the following day, two rounds of patient treatment were conducted before the closed valve was discovered. If a fire had occurred, neither the handlines nor the deluge system would have worked.

In Case 11, the maintenance procedure for fire suppression system testing specified opening this isolation valve after the test was completed. Also, the daily facility start-up checklist included verifying this isolation valve is in the open position. In this case, neither the maintenance procedure nor the start-up checklist was performed properly. Perhaps there should be additional training on the maintenance procedure. Perhaps a pause point at the end of the maintenance procedure could be added, with a checklist tool. Perhaps the daily start-up checklist could be revised. We cannot ignore contributing factors such as deeply ingrained habits, poor team communication, and workflow issues. However, in this case (and many others), one obvious fact stands out. A checklist, used properly, would have prevented the unsafe condition. No matter how well designed a checklist is, the checklist cannot force someone to use it.

KEY POINTS FROM THIS ARTICLE

The pause point is the single most important concept. A checklist only exists to serve the pause point. Not every pause point needs a checklist. The following essential elements drive the decision to create a checklist tool:

- Identify pause points
- Identify the hazard(s) that exist beyond each pause point
- Identify the action(s) we must take to mitigate risk.

Failing to appreciate the importance of the pause point and/or missing the pause point are common mistakes. The following factors can contribute to these failures:

- Bad habits
- Workflow issues
- Physical layout
- Lack of team communication

Existing workflows should be analyzed. If a current workflow contributes to missing pause points, it may need to be re-designed.

The checklist is meant to be a tool, not a piece of documentation. Designing a checklist to fit the documentation process and/or placing the checklist tool inside the EHR takes our focus away from the pause point.

Checklists come in a variety of styles. The design of a checklist is based on the nature of our actions at the pause point. The following factors drive the design of a checklist:

- Urgency of action
- Complexity of the task(s)
- Familiarity/experience with the task(s)

How do we get people to use checklists properly? There is no obvious answer. Existing checklist tools should be analyzed. For each checklist, consider changes that might make the tool more effective. To address the human factors, education is a good start. If we appreciate the importance of pause points and stay focused on them, it may improve checklist utilization.

REFERENCES

1. Gawande, Atul. The Checklist Manifesto: How to Get Things Right. New York: Metropolitan Books, 2010.
2. "Habit". Wikipedia The Free Encyclopedia. 7 July 2021, https://en.wikipedia.org/wiki/Habit
3. Health Care Facilities Code Handbook, 12th Edition. Quincy, MA: National Fire Protection Association, 2021.
4. "Universal Protocol - Pre procedure Verification Checklist". The Joint Commission. 7 October 2021, https://www.jointcommission.org/standards/standard-faqs/office-based-surgery/national-patient-safety-goals-npsg/000002148/
5. "Workflow". Wikipedia The Free Encyclopedia. 10 November 2021, https://en.wikipedia.org/wiki/Workflow

CONTINUING EDUCATION CREDIT

This article has been reviewed and is acceptable for 1.5 Category A credit hours by the National Board of Diving and Hyperbaric Medical Technology.

To purchase continuing education credit for this article, go to: **https://learn.hyperbaricmedicine.com**

International ATMO, Inc.
105 S Saint Marys Street, Suite B1
San Antonio, Texas 78205
Phone: 210-614-3688
Email: education@hyperbaricmedicine.com
Web: https://hyperbaricmedicine.com

Attachment 1 (Source: *The Checklist Manifesto*)