Progressive Tinnitus Management Training: A Development Model for Content Currency in a Field in Flux

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ABSTRACT

Developing high quality training for wide distribution with stable content is easy compared to content that is rapidly evolving—it is like trying to paint a sports event while the event is taking place. Healthcare has always had an abundance of content that is volatile to the press of research, best practice models, scientific and technological discoveries and new medications, techniques and procedures. How do you keep the content aligned with research discoveries and new best practice strategies? This paper explores the techniques and technologies successfully used to keep critical clinical training up-to-date. While these concepts and methodologies apply to any field we will illustrate the application of the design and development techniques and technologies through the process used in Progressive Tinnitus Management training in the Department of Veterans Affairs (VA). One in three Veterans returning from Iraq and Afghanistan has some degree of disability related to tinnitus and/or hearing loss. The VA, in collaboration with researchers and clinicians, using an innovative approach created a 12 hour On-Line Curriculum of Progressive Tinnitus Management for clinicians to better help Veterans manage their reactions to tinnitus.

Developers and subject matter experts, using a collaborative Learning Content Management System (LCMS), are able to rapidly prototype the content of training. This innovative development strategy allowed content and development to adapt to new information in real-time. The authors outline what it takes for a virtual interdisciplinary team to rapidly develop efficient and effective training for fields in flux.

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Content Evolution

Developing high quality training for wide distribution with stable content is easy compared to content that is rapidly evolving—it is like trying to paint a sports event while the event is taking place. Healthcare has always had an abundance of content that is volatile to the press of research, best practice models, scientific and technological discoveries and new medications, techniques and procedures. How do you keep the content aligned with research discoveries and new best practice strategies? This paper explores the techniques and technologies successfully used to keep critical clinical training up-to-date.

While these concept and methodologies apply to any field we will illustrate the application of the design and development techniques and technologies through the process used in Progressive Tinnitus Management (PTM) training in the Department of Veterans Affairs (VA). One in three veterans returning from Iraq and Afghanistan has some degree of disability related to tinnitus and/or hearing loss. The VA, in collaboration with researchers and clinicians, used an innovative approach in creating 12 hours of On-Line curriculum for PTM for clinicians to better help Veterans manage their reactions to tinnitus.

Tinnitus

The numbers of tinnitus-disability claims have increased significantly in the last 10 years. According to the Veterans Benefits Administration (http://www.vba.va.gov/REPORTS/abr/2011_abr.pdf), tinnitus has been the most prevalent service-connected condition since Fiscal Year (FY) 2008. By the end of FY 2011, a total of 840,865 Veterans were service connected for tinnitus. During FY 2011 alone, 87,621 Veterans were awarded a new tinnitus service-connection.

Tinnitus can be caused by many conditions. There is a significant association between tinnitus with noise exposure, hearing impairment, traumatic brain injury (TBI) or neck injury, ear disease, heart disease, jaw conditions, and medication use. In rare cases, a serious condition such as a tumor can cause tinnitus. Some patients with tinnitus present with mental health symptoms that indicate the need for an evaluation by a psychiatrist, psychologist, or other licensed mental health professional. Tinnitus can be associated with mental health symptoms, untreated post-traumatic stress disorder (PTSD) and/or TBI (Myers, Henry, & Zaugg, 2008; Myers, Henry, Zaugg & Kendall, 2009, Fagelson, 2007). It is therefore important for patients with bothersome tinnitus to be evaluated and offered intervention when appropriate from an an interdisciplinary team.

Most persons who experience tinnitus are not bothered by it or only require some rudimentary information about it. Epidemiological studies generally reveal that about 80% of people who experience tinnitus are not particularly bothered by it. The remaining 20% are bothered, but to different degrees (Dobie, 2004). Therefore available services should be progressive, ranging from patient education and reassurance to more comprehensive services including amplification, relaxation techniques, medical treatment, cognitive-behavioral therapy, drug therapy, sound therapy (maskers and masking devices), or combined techniques. People who have bothersome tinnitus commonly need assistance from multiple disciplines in order to have all their tinnitus-related needs met. For this reason the approach tinnitus management needs to

be interdisciplinary. (Henry, Zaugg, Myers, Kendall, & Michaelides, 2009). The development of interdisciplinary training materials for staff and patient education content (Henry, Zaugg, Myers, Kendall, & Turbin, 2009) requires subject matter experts from various disciplines. Each field must contribute to the curriculum content based on changing research findings and clinical needs.

Meeting the Challenge

Health care across all settings has been experiencing a dramatic and unprecedented turmoil. There are many causes of this unrest, but mostly relate to changes in reimbursement, demands of regulatory bodies, and patient factors. The recent changes reflect measures to contain escalating health care costs, and they affect all aspects of health care delivery (ASHA http://www.asha.org/slp/healthcare/acute_care.htm). Health care content requires rapidity and adaptability for survival. What was the standard last year is quickly thrown aside for some new directive, political profile or research result. Very few issues regarding healthcare are static. Thus, in order for us to make the contributions necessary to provide the value in health care content currency, we must become adept at managing change at a fast pace. Healthcare is an area in which change is characteristically slow.

The gap between the discovery of knowledge and its use in practice remains (LoBiondo-Wood and Haber, 2006) but work is being done on the best ways to translate research into practice, generating a new area of health care science called translation science. Eventually the promise of translation science is to provide evidence on the best ways to incorporate best evidence into health care. (Dawes et al, 2005; Hamer and Collinson, 2005; Larrabee, 2009a; Larrabee, 2009b; Malloch and Porter-O'Grady, 2010).

Yet many of the changes we promote or advocate in tinnitus management based on research occur over timeframes of several months to a few years. Translating tinnitus research findings into clinical practice takes many years. Thus the instability associated with tinnitus management content change is emphasized in this arena of rapid change. To highlight the rapid changing nature of tinnitus management training, the evolution of PTM will be discussed.

The method of PTM is the net result of over 15 years of clinical research. Tinnitus research has been conducted at the VA National Center for Rehabilitative Auditory Research (NCRAR) continuously since its inception in 1997. A total of 18 funded tinnitus projects have been completed, and two are currently underway. All of these studies focus on some aspect of tinnitus clinical management. The evolution of PTM content is a result of the shifting changes in tinnitus research and clinical needs. Specifically, PTM content originated from Audiologic Tinnitus Management (ATM), to Progressive Audiologic Tinnitus management (PATM), to Progressive Tinnitus Management (PTM) within a seven year time span.

The ATM method (Henry, Zaugg, & Schechter, 2005a, 2005b) provided specific guidelines for audiologists to implement a well-defined program of tinnitus management. Subsequent tinnitus clinical research pointed to the need to provide tinnitus clinical services in a hierarchical manner, that is, to provide services only to the degree necessary to meet patients' individual needs. In addition, there was a need to make numerous changes to the ATM assessment and intervention methodologies to improve the effectiveness and efficiency of the clinical protocol. ATM therefore was completely revamped, resulting in a five-level hierarchical program of tinnitus management referred to as Progressive Audiologic Tinnitus Management (PATM).

The primary objectives of PATM (Henry, Zaugg, Myers, & Schechter, 2008a) were to provide the following services to patients who complained of tinnitus: (a) education to facilitate the acquisition of tinnitus self-management skills; (b) a progressive program of audiologic assessment and intervention that addressed each patient's individual needs; and (c) ensuring that patients were referred appropriately for medical and mental health services if needed. PATM was patient-centered with a focus on individualized management, patient and family education, counseling, and support. PATM used therapeutic sound as the primary intervention modality, and was distinguished from other sound-based methods (Neuromonics Tinnitus Treatment, Tinnitus Masking, and Tinnitus Retraining Therapy) in that the sound-management protocol adapt to address patients' unique needs. The specific use of therapeutic sound with PATM was (a) similar to any of these other methods, (b) a combination of methods, or (c) an altogether different approach to using sound. Therapeutic sound can be used in a variety of ways, which is necessary because patients encounter different situations that differentially affect how they react to their tinnitus (Henry, Zaugg, Myers, & Schechter, 2008b).

The focus of PATM patient education content was to provide patients with the knowledge and skills to have confidence to use sound in adaptive ways to manage their reactions to tinnitus in any life situation disrupted by bothersome tinnitus. This was accomplished by helping patients develop and implement individualized sound-based management plans to address their unique needs. Veterans with tinnitus responded well to sound

based strategies for managing reactinos to tinnitus, but it quickly became clear that incorporating mental health services into PATM was a critically needed addition. PATM content therefore was modified to include Cognitive Behavioral Therapy (CBT) based coping skill techniques taught by mental health professionals. These CBT based coping skill techniques are helpful for all people with bothersome tinnitus, and are particularly important for tinnitus patients who also experience PTSD, depression, anxiety, or other mental health problems. As PATM has evolved to become inherently interdisciplinary, use of the word "audiologic" to describe the protocol no longer was appropriate. For that reason, the name was shortened to PTM.

Adapting tools, technologies and methodologies

The PTM model was designed for implementation at any health care facility that desires to optimize resourcefulness, cost efficiency, and expedience in its practice of tinnitus management. Also, PTM has been adapted to quickly identify and meet the unique tinnitus management needs of Veterans and military members with TBI. This modified centralized approach to tinnitus management allows for frequent and brief intervention to accommodate the needs of people with impaired memory, limited concentration, and other cognitive difficulties often associated with TBI via education by an audiologist and mental health provider on the telephone.

Following the incorporation of routine mental health services into the PTM protocol, a series of three books were written and published to support the methodology (Henry, Zaugg, Myers, Kendall, 2010 a,b,c). These books describe how mental health services are incorporated into PTM, but the books are oriented to audiologists. The books were published by VA Employee Education System and distributed to all VA audiology clinics.

Building the train while on the tracks

From the initial content of the Clinical Handbook, an online interdisciplinary staff training course (consisting of 19 comprehensive Web modules of training) was developed to provide detailed clinical education, guides, and updated tools and video products to conduct PTM. These materials were developed in conjunction with a randomized clinical trial funded by the VA Rehabilitation Research and Development (RR&D) Service and the VA Employee Education System (EES). This is a worthy example of translating research findings to clinical practice. Developers and interdisciplinary subject matter experts, using a collaborative learning content management system were able to rapidly prototype the content of training and modify it during the two years of development. This innovative development strategy allowed content and development to adapt to new information in real-time.

We recognize that numerous methods of tinnitus management are in use and that clinicians often disagree regarding the most effective approach. A number of controlled clinical studies have been completed that demonstrate benefit to the majority of participants enrolled in these studies. However, these studies are not definitive; thus, clinicians have the latitude to use any method that has research support. It is important to recognize that evidence-based tinnitus interventions use some combination of three broad components: education, relaxation techniques, and therapeutic sound. Addressing some or all of these three components in general provides reasonable benefit such that many patients notice a significant improvement in their quality of life. Of course, there is no cure for tinnitus; thus, patients must realize that, no matter which method is applied, their tinnitus perception will most likely remain unchanged and that clinical management focuses on reducing any negative reactions associated with the tinnitus.

Although many practitioners already are conducting some form of tinnitus intervention, others have little to no experience providing tinnitus services. Experienced clinicians generally have definite ideas about how to go about providing tinnitus services to their patients. These clinicians can adopt PTM as described in the online course, or they can use the different levels of PTM as a framework within which to conduct their preferred form of intervention.

PTM has been developed to a high degree of specificity, but it is important to realize that the methodology is considered a "work in progress." The researchers are learning continually, from both patients and clinicians in research and clinical practice, and the methodology is revised to be appropriately responsive to this feedback. Clinicians are encouraged to modify the materials and procedures as necessary to meet the needs of their patients and their clinics. If they have suggestions for changes/improvements to PTM content, they are advised in the online training modules to contact any of the authors of PTM.

The need for a progressive approach to tinnitus management became apparent as a result of conducting NCRAR's series of controlled clinical studies. The PTM methodology evolved largely as a result of these experiences. Additional influences for PTM came from clinical experiences with patients and from consultation with experts from different disciplines whose insights in particular shaped the PTM patient education. PTM is designed to address the needs of all

patients who complain about tinnitus while having minimal impact on clinical resources.

NCRAR has conducted numerous clinical studies to evaluate different methods of tinnitus management, and their research continues. We are always learning from these studies, which results in refinements to PTM. It needs to be emphasized, however, that our research is by no means conclusive. Much more research is needed, by us and by others, to more definitively identify the components of intervention that are most effective. Research also is needed to compare outcomes between methods. Methods that should be subjected to rigorous comparative studies include Tinnitus Retraining Therapy, Cognitive-Behavioral Therapy, Neuromonics Tinnitus Treatment, and PTM. It seems likely that certain patients are more suited to some methods than others. The only way to answer these kinds of questions is to conduct prospective, controlled studies. If such studies are conducted in the future, modifications to PTM content will be made as warranted.

Instructional Technology and Delivery Mode

Instructional methods and strategies are almost always more important than the delivery modality or technology; however, some modalities can make instructional objectives (and learning) effective while others can render instructional strategies moot. For illustration consider the affective objective: "learners will choose to contribute more to their retirement plan." Which delivery medium would be most successful: (a) a text-based, on-line product or (b) a gripping video-based scenario that brings you to tears. It is easy to see that video-based strategies have a much stronger ability to elicit emotional response than does the technology of text. Consider learning times-tables by listening to a lecture verses a drill and practice game on-line or grasping hydraulic capabilities without animation or simulation. These are dramatic examples to illustrate the point that instructional objectives need to be married to presentation modes that can effectively execute the prescribed instructional strategy and thus help learners learn, retain and transfer that learning.

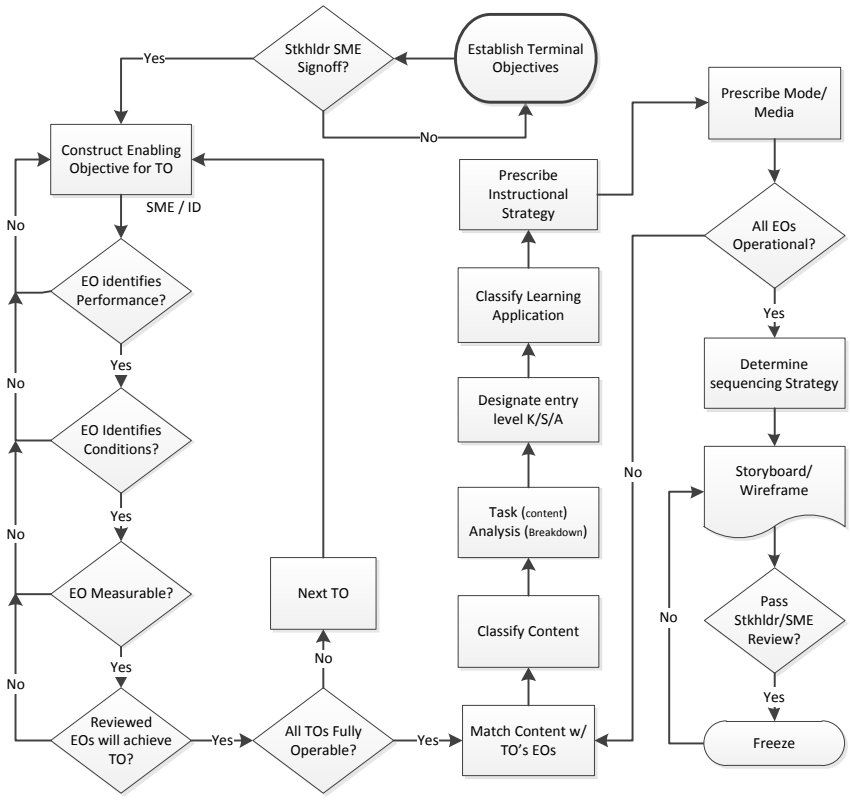

Figure 1 Customary Development Model

There are many other factors that influence media delivery modality selection beyond those that are most instructionally effective, there are economic, audience, infrastructure, environment, and performance issues such as the difficulty of a procedure, its criticality and the frequency of its performance in the workplace; there are also pragmatic realities. Many effective instructional delivery methods are costly and time consuming: consider simulation and animation or virtual-reality. The delivery modality determines the development process and to a large extent the expense and timeline.

These effective instructional delivery modes require that content be unchanging and "frozen" (See Figure 1) before the development process begins and throughout the process. Development can take many months or even years. With the training of clinicians in PTM the training content is dynamic. This is not peculiar to clinical healthcare. There is rapid change in many fields across the spectrum of learning content but it is especially true in technology, science and medicine. Keeping content current is widely recognized as an issue in shared training (see Lindsey, Pisel and Pike 2011). Rather than "freeze" content and teach with outdated content another approach was needed.

Instructional Integrity vs. Timeliness

Treating more than 800,000 tinnitus patients each year provides an ideal environment for nurturing expertise and advancing research. Disseminating findings through training also required a novel approach.

With the instructional needs validated and the nature of the needs understood, more than 12 hours of training was determined necessary; much of this training was based on existing materials; however over the course of the development current practices need to be infused into the instructional products.

Given the nature of the instruction and the critical need, the complexity of the materials and the frequency of the application of the concepts, processes and procedures a rapid-prototyping process was initiated. This process reduces costly steps by leveraging technologies (see Twitchell 2000). The "Acquire, Buy or Build" decision process determines that existing training materials are inadequate but can be used as a foundation. New materials and the ability to modify and update over the development cycle are also crucial. In our decision we were left with two options; (1) contract for the design and development or (2) initiate an internal development effort. Each option has advantages and disadvantages.

Contract options

In government contracting, the 'Fixed Price' contract is king. Despite the logical possibility of a Time and Materials contract, to care for a project with content in a state of flux, such contracts are seldom if ever approved and therefore improbable and unrealistic. In government training, nearly 100% of the hundreds of contracts let each year are Firm Fixed Price contracts. Under a fixed price contract ill-defined projects cost more. For a one hour course costing can more than double depending on the need for continual review and revisions (see Figure 2).

Initial government estimates placed the Tinnitus courseware design and development at approximately $1.8M under a fixed price contract. Even under such a contract the end result would have fielded dated content (see Figure 3). But contract cost is only one aspect of the real cost of keeping training current when content is changing rapidly. Figure 4 depicts the relationship between content stability and contract length.

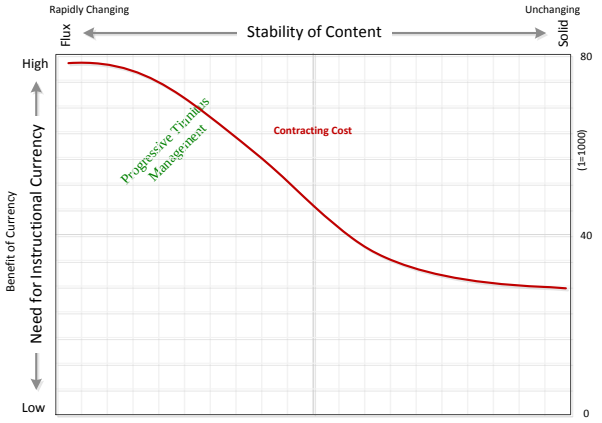

Figure 2 Content Stability and Cost

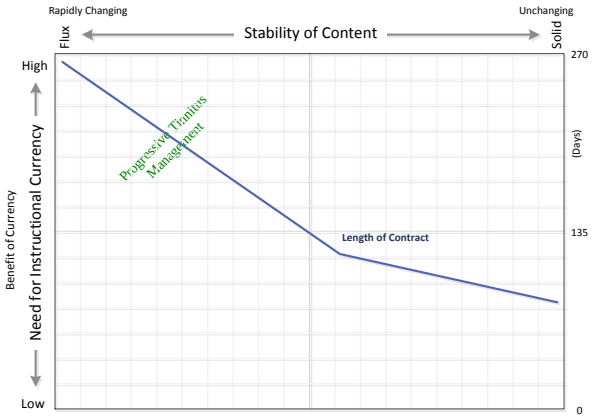

Figure 3 Content Stability and Contract Length

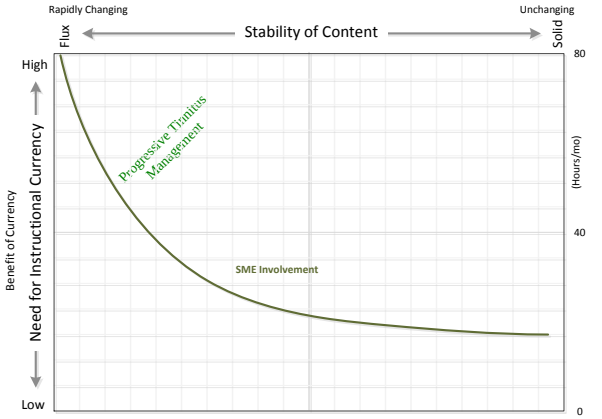

Figure 4 Content Stability and SME Involvement

Internal Development

Initially the determination to design and develop the PTM curriculum using government personnel and resources was a process of elimination; it seemed to be the only available process that had the potential to ensure both a timely and economic product. The risk was thought to be in ensuring efficacy and quality in the learning experience. The results have surprised some experts in the development arena and pushed the envelope to establish a new standard for dealing with training where currency is a priority.

The Development Process

The development process is initiated with the decision by the project manager to proceed to development.

In the standard VA/EES development model, the product development flows linearly to the developer from the project manager. This process starts after the educational content is finalized by the Subject Matter Experts as seen in Figure 5.

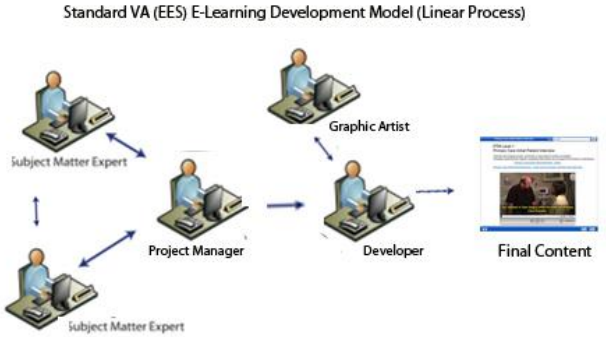

Figure 5 Traditional Internal Development Model

In the Currency development model, advocated in this paper, the entire project team works collaboratively in an on-going basis, refining the educational content, design, and development. The content development process proceeds on an on-going basis with the Subject Matter Experts and the Project Manager.

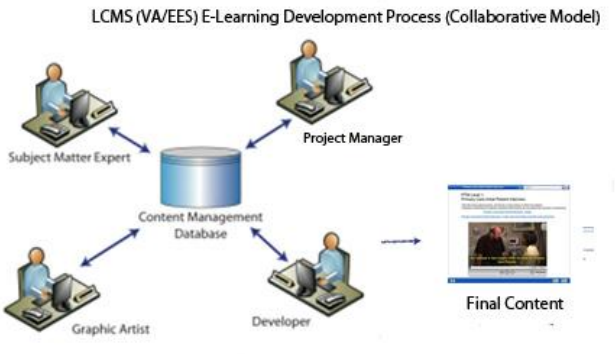

Figure 6 Currency Development Model

The Content Management System ensures the most current content is available at all times. At any point in the cycle, content is instantly available to add, delete, change without delaying development. Figure 6 depicts real-time viewing by Developer, Illustrator and SME.

The Tinnitus development team consists of:

- Subject Matter Experts (SMEs),
- Project Manager,
- Instructional Designer
- Web Developer (E-Learning Producer),
- Graphics Support,
- Other Media Support (Video),
- Project Support Staff.

Estimate of Development Effort

- Teleconference –2 hours weekly
- SME's – 3-4 hours weekly development meetings –Audiologists (GS 11-14)
- Project Manager –1 hour Project Management Meeting (GS 13)
- E-Learning Producer –25 to 50 Percent FTE depending upon project activity (GS 13)
- Instructional Design –1 hour weekly (GS 13)
- Graphics –3-4 hours weekly (GS 12)
- Project Support Assistant –3-4 hour weekly (GS 6/7)

Throughout the development process, the project team meets weekly via Teleconference and Cloud based development System using a Learning Content Management System and its internal development and authoring tools.

The product relies on up-to-date discussion and latest research finding to galvanize the learning process and illustrate best practice and new findings. All course content, once imported or created in the LCMS authoring tool can be updated, deleted, reorganized or reformatted by a skilled developer in seconds and shown to SMEs for review immediately.

Review Process

Content is reviewed incrementally as subject matter experts refine content on a weekly basis. Modified content is submitted as necessary to the Developer in the Development Process. Content is modified in a dynamic cycle off-line with written content updates and dynamic updates during the weekly teleconferences. Graphics are updated dynamically as necessary in the regular development meetings with the graphics professional creating and/or modifying content, transferring the content via e-mail or FTP to the Developer, and Developer applying the changes in real time to the evolving content. This process is

unsustainable in a firm fixed price contract and there is no similar process available in a time and materials contract with known technology. This process is applied in the SME Review Cycle. Text and/or media content may be modified in real time and the Reviewers and Developer are delivered the updates in real time.

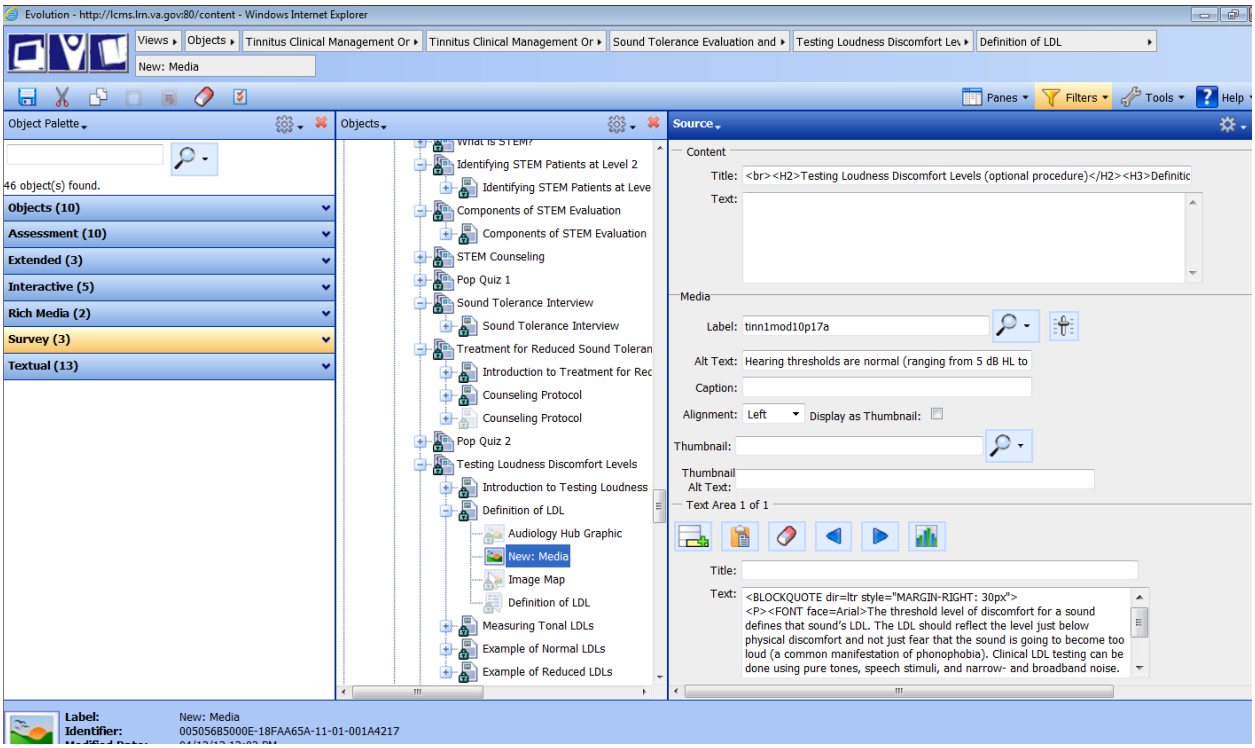

Figure 7 LCMS Authoring Tool Management Screen

Advantages – Content cycle time is reduced for managed content changes. Complex changes are recorded in the teleconference by the Developer and are applied after the call. Reviewers log-in to the system as their schedule permits to review and comment on the applied changes. Reviewers and Developer review interim updates, further modifications made as necessary, and the development/review cycle proceeds through the project development cycle.

Dynamic Content and User Interface

The content presented to the learner is independent of the interface design. All the assets in a course in the LCMS authoring environment (e.g., text, pictures, slides shows or video, flash objects and assessment tools) are built dynamically from the content management system database. At all phases of development, any content, including the over-all course structure, may be changed immediately; Figure 7 depicts the authoring environment. The LCMS database is updated with the content changes when the browser is refreshed.

In the Tinnitus On-Line Course Example, a virtual practicum was developed to present typical case scenarios to clinicians. This content (see Figure 8 and 9) was developed from the initial step of identifying the need to current production development, shown below.

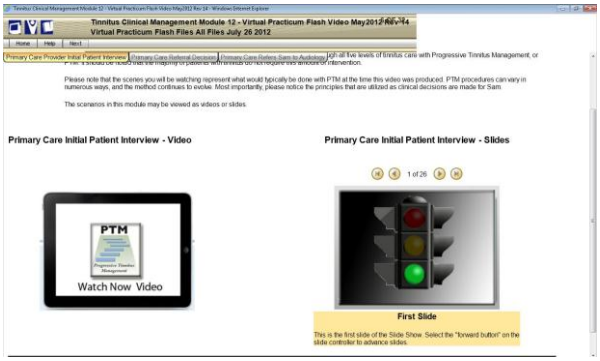

Figure 8 Dynamic Presentation Sample Viewer A

Note: Content presented in the two screen captures (Figure 8 and 9) is identical. The Viewer, the navigational interface for the content, is updated dynamically by the Developer and delivered immediately when the browser window is refreshed.

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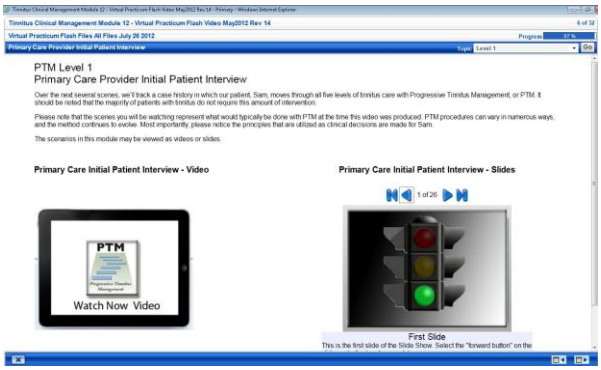

Figure 9 Dynamic Presentation Sample Viewer B

This massive undertaking highlighted the need to assemble all team members at the outset of the project and identify project requirements of all team members. It was important to assure buy-in by all team members in collaborative real time development environment. It required a "cultural" shift for persons used to the process of identifying the materials necessary "before" work begins and then creating a contract that "transfers" the work to the contractor. A typical contract project then relies on contract oversight in reviewing Contract Performance. Hands-On development entails a high level commitment by each member of the project team with the success of the project determined by consistent effort by all team members. There is no way to "hide" in this process as the success of the project is determined by the success of the entire team. In the absence of complete buy-in by all members, the project is unlikely to succeed. Additionally, if members due to external factors, including other work constraints, are unable to continue throughout the project, a process at the outset for "member" addition and subtractions should be identified.

It is essential that all critical steps in this project are clearly articulated at the start and individual performance expectations are clearly defined. Not all persons are a good fit for working in collaborative, dynamic and real-time development processes, due to personalities, cultural barriers and work constraints. There should be no "adverse' outcome for persons who do not wish to be in this type of project nor a negative outcome if a person subsequently chooses to leave the project team. However, as the project evolves, the role of each member is increasingly essential and mid-stream changes require advance planning in resources and timelines.

Au Courant (up-to-date)

As mentioned earlier, the development of PTM has been an evolutionary process. The NCRAR research group started conducting tinnitus research in the mid-1990s. The first focus was measurement of tinnitus, which was expanded to conduct controlled clinical studies to evaluate methods of tinnitus management. By the year 2000, tinnitus was becoming a highly visible concern to the VA, and it was essential to provide evidence-based methodologies for tinnitus management that could be utilized in the VA system. The NCRAR research adapted to this challenge by developing tinnitus management methods that addressed the specific needs of the VA, VA clinicians, and Veteran patients.

The first challenge was to develop a method that could be incorporated into busy VA audiology clinics. VA audiologists were already working to capacity to meet the demands of Veterans requiring services for hearing loss. Adding tinnitus management to their busy schedule required developing a program that could be implemented efficiently within clinics. The method of PTM addresses that need by providing a stepped-care approach so that patients are provided tinnitus services only to the degree needed. We also developed the primary intervention to be conducted in a group setting, which is much more efficient than one-on-one intervention. This program has worked well for many audiology clinics that have adopted the program. However, it also became evident that tinnitus management must be interdisciplinary. In particular, mental health services needed to be integrated into the program. PTM thus evolved to meet this need, and mental health became a critical component of the PTM method.

Integrating mental health, however, created a new set of needs, i.e., mental health services in the VA system are stretched to their limit meeting the needs of Veterans with a variety of mental health challenges. We again were faced with the need to develop a program that would be highly efficient for involving VA mental health clinicians in the program. Mental health providers do not typically consider tinnitus to be within their scope of practice. Part of the challenge, then, is to develop programmatic elements that can be adopted by mental health providers rapidly and efficiently—without disrupting ongoing mental health programs. We are now in the process of developing mental health training materials that are equivalent to the training materials that have been developed for audiologists. These materials include books, videos, and the online training course.

Meeting the challenge

Clearly, tinnitus management for Veterans is an evolving program. The program of PTM is not static, and changes are made almost continually. Meeting the challenge of these constant changes requires a training modality that is similarly adaptable so that changes can

be incorporated rapidly and clinicians in all disciplines can be kept up to date. Real-time development and online training meets this need.

The Future

The first twelve hours of PTM training (modules 11 of 19) were recently posted on TMS and results of the module learning assessments will be analyzed via item analysis. The learning assessment item analysis will provide the Project Team with information regarding the knowledge and skills acquired by learners as a result of completing the online training. The online modules also serve as content for providers wanting to in-service various disciplines. The subject matter experts receive emails from providers across the nation for in-service content and now the SMEs have been able to share this notable resource freely.

Next steps

Modules 12 through 19 (supplementary tinnitus management content) are in the final development stages and will be made available by the end of this year. These learning modules will be shared with the Department of Defense for military audiologists and other personnel to utilize. CEUs are available to audiologists who complete the modules and pass the learning assessments.

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