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The Development of Specifications and Discussion of Business Models for Ensuring Speech Privacy in the Healthcare Industry

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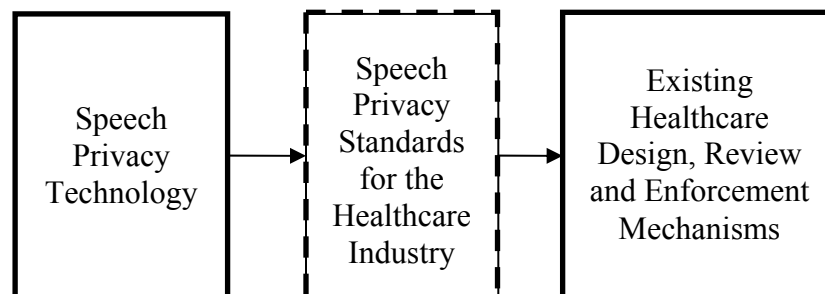
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ABSTRACT

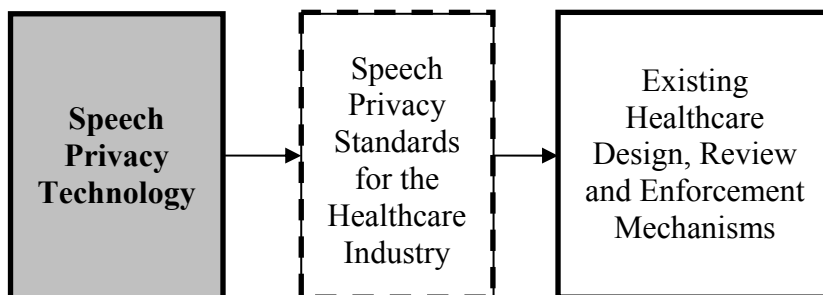
The Health Insurance Portability and Accountability Act of 1996 (HIPAA) was developed among other reasons to hold healthcare providers accountable for the privacy of patients' personal and medical information. It includes language addressing the need for 'reasonable safeguards' for speech privacy and oral communication in a healthcare setting. After 50 years of development, speech privacy science and mechanisms are well-understood. However, current specifications cannot be directly applied and are not specifically written to address the application of the current acoustical knowledgebase to the healthcare industry's need for compliance. This is a discussion of the state of existing privacy technology and specifications; the ability and availability of mechanisms currently in the healthcare industry as a possible route for implementation of the regulation; the state of development of specification to address the industry's needs; and a potential business model for implementation.

1. INTRODUCTION



Standards that will clarify and directly link the current speech privacy technology to the healthcare industry's need to comply with current information privacy regulations are being developed. The committee for establishing these standards is within the Acoustical Society of America and is working hard to build this important stop gap. The new standards will need to address design, construction and renovation of healthcare facilities as well as the monitoring of compliance after the fact.

2. OVERVIEW OF SPEECH PRIVACY TECHNOLOGY



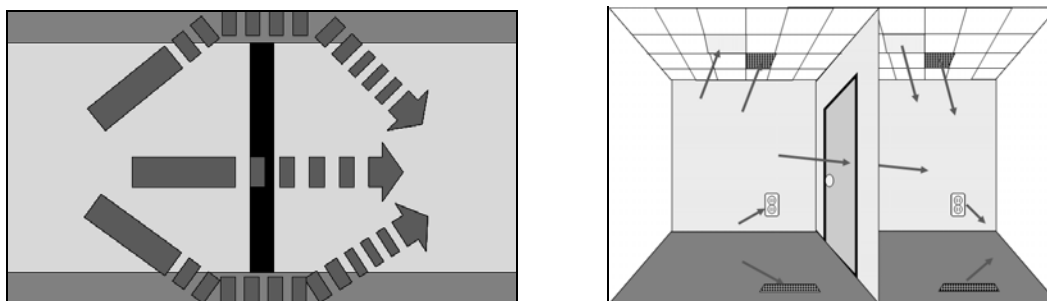
Speech privacy is a well-developed science - a function of the source, the pathway and the listener. The source in the case of speech privacy is a person talking. The pathway is primarily related to the acoustical characteristics of the building. This includes the architecture itself (walls, ceilings, doors, distance, etc.) and its effectiveness for blocking the intelligibility of speech signals. It also includes the background noise and its effectiveness to reduce the signal to noise ratio. The listener is somebody to whom the information is to go exclusively and be kept private during a specific communication. There are several metrics and standards that define applicable way of describing both speech privacy and the associated mechanisms.

A. Architectural and Design

The effectiveness of an architectural system in reducing a speech signal from the source to a level de-articulated by the background noise at the receiving point has two fundamental components:

- **Absorption:** Attenuate the voice signal in the source area with proper absorption; and
- **Reflection:** Block the transmission of the voice signal from space to space.

Figure 1 - Pathways for Sound in Adjacent Closed Spaces



The primary signal paths from room to room are transmission through the walls, ceiling plenums, and in-floor air plenums (Figure 1). Each of these primary signal paths has potential leakage sources (Figure 1), including:

- Door jams and sills;
- Electrical outlets and light switches;
- Light and other fixtures in the ceiling, which typically allow for less transmission loss than the ceiling material; and
- Air supply and return fixtures.

B. Masking

Masking for privacy is the introduction of “shaped” broadband sound into a space for the purpose of interfering with the intelligibility of an intruding speech signal. Masking is always adjusted from the potential overhearer's position. A wide variety of off-the-shelf masking systems are available.

Masking systems have a definite “window” for successful operation. Masking with an overall sound level below 40dBA is generally ineffective. Masking with an overall sound level above 48dBA (in closed offices) is too loud, and occupants raise their voices in competition with the system. The spectral content of the emitted masking signal is critical to ensure effectiveness. Improper installation or tuning of masking systems can produce unsuccessful and potentially annoying results.

C. Measurements and Current Applicable Standards

There are several current standards related to speech privacy. Yet these do not directly address the current healthcare industries’ need to comply. These standards include, but are not limited to:

- **ASTM E1130** Measurement of Speech Privacy in Open Offices Using Articulation Index
This is the primary standard for measuring and calculating Privacy Index (PI). The standard defines the calculations for determining a PI from measured noise reduction between two rooms or areas (open or closed spaces) and the interaction to a background noise level/content. ASTM has recognized the value of updating this standard for healthcare-specific applications as well as closed-room procedure clarity. Updating and rewriting of this standard was approved this past spring by ASTM;
- **ASTM E336** Measurement of Airborne Sound Insulation in Buildings;
- **ASTM E1110** Determination of Articulation Class;
- **ANSI 3.2** Method for Measuring the Intelligibility of Speech Over Communication Systems;
- **ANSI 3.5** Methods for Calculating Articulation Index;
- **ISO 60258-16** Objective Rating of Speech Intelligibility by Speech Transmission Index; and
- **ISO 9921-1** Speech interference Level and Communication Distances for Persons with Normal Hearing Capacity in Direct Communication.

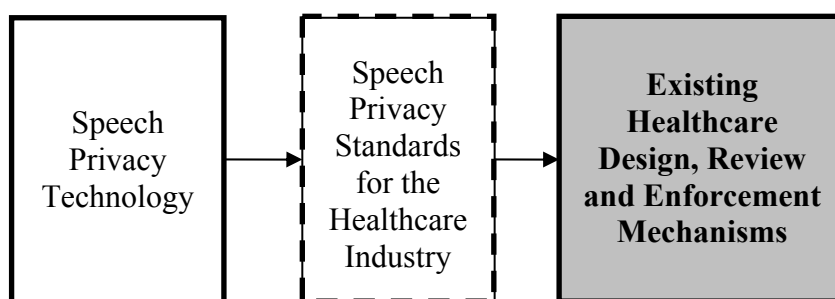
D. Metrics

The standards above define several noise metrics related to speech privacy. These metrics include, but are not limited to:

- **Privacy Index (PI):** Quantification of the received (reduced by architecture) signal to noise ratio on intelligibility of speech for the purpose of privacy. Privacy Index can be separated into three general levels of privacy:
 - Confidential (PI 95 to 100%) - Confidential conversation. Appropriate for privacy critical areas such as treatment rooms, consultation rooms, exam rooms, doctor’s offices or transcription areas;
 - Normal/Nonintrusive (PI 80% to 95%) - Conversation can be understood but not distracting. Occupants can focus on tasks and work with out being pulled into conversations. Staff needs to be aware of sensitive subjects and move them to a confidential room as warranted; and

- Poor/Marginal (Not private) (PI 60% to 80%) - Staff needs to be aware of sensitive subjects and move them to a confidential room as warranted.
- **Articulation Index (AI):** Quantification of a signal to noise ratio on Articulation (intelligibility) of speech;
- **Sound Transmission Class(STC) and Noise Isolation Class (NIC):** Wall performance to reduce (both contain and absorb) sound;
- **Room Criteria (RC):** Background noise standard for unoccupied spaces; and
- **Noise Criteria (NC) and Balanced Noise Criteria (NCB):** Background noise criteria for occupied spaces perception.

3. OVERVIEW OF EXISTING HEALTHCARE DESIGN, REVIEW AND ENFORCEMENT MECHANISMS



The U.S. Department of Health and Human Services (HHS) issued the Privacy Rule to address the use and disclosure of “protected health information” (PHI) by organizations (or “covered entities”) as well as standards for individuals' privacy rights to understand and control how their health information is used. This includes verbal information and oral communications. The Privacy Rule protects all "individually identifiable health information" held or transmitted by a covered entity in any form or media, whether electronic, paper or oral¹. Currently, HIPAA enforcement is primarily by way of complaints filed with the Office of Civil Rights (OCR) or lawsuits filed in court.

It is important the new standards be able to be implemented within the current healthcare industry structure. There are two mechanisms in the healthcare industry that can act as primary connection points for present speech privacy technology; during the design, construction or renovation phase of hospitals and the (re)accreditation process. The standard guidelines and review process criteria clearly show how until now, speech privacy has been viewed as a patient dignity and patient care issue, not a security and information management issue. However, speech privacy is fundamentally associated with both issues. A comprehensive approach can improve the quality of the healthcare environment and better protect the dignity of a patient, while insuring the compliance with the new information privacy laws.

The American Hospital Association's and the American Institute of Architects' Guidelines for Design and Construction of Hospital and Healthcare Facilities is the primary reference for planning, constructing or renovating non-military healthcare facilities. This guide also contains key standards that are reviewed when surveying, licensing, certifying or accrediting completed healthcare facilities². There are several references to acoustic privacy within the document (Table 1). However, they are not standardized across all HIPAA covered entities and, in most cases, are not quantifiable or measurable. These alone do not meet the definition of “reasonable safeguards”.

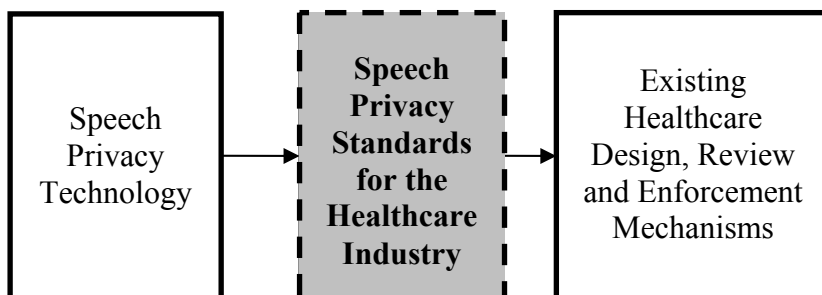
The Joint Commission on Accreditation of Healthcare Organizations (The Joint Commission or JCAHO) implements and manages the independent reaccreditation process for healthcare facilities. Triennial independent inspections and review of facilities are made as part of the reaccreditation procedure. The Joint Commission has several information management and ethics and dignity standards that deal with speech privacy, yet most are not specific enough to meet the definition of “reasonable safeguards”.

Table 1 - Acoustic Privacy Standards Outlined in the Draft 2006 Guidelines for Design and Construction of Hospital and Healthcare Facilities

Facility Type	Acoustic Privacy Standard	Quantified/Measurable	Possible Applicability to HIPAA
General Hospital	Noise Control for Pediatric Critical Care	Yes	Poor
	Area Specific Wall Design Criteria (Minimum STC Requirements)	Yes	Good
	Acoustic privacy in bathroom	No	Poor
	Patient room Acoustic Privacy for Coronary Care Patients	No	Poor
Rehabilitation Center	Area Specific Wall Design Criteria (Minimum STC Requirements)	Yes	Good
General Psychiatric Nursing	Acoustically private consultation room(s)	No	Fair
	Separate and acoustically private charting area	No	Fair
Outpatient	General acoustical privacy throughout the care process	No	Poor
Adult Day Healthcare	Telephone's to afford privacy during use.	No	Fair
Assisted Living	Acoustic privacy in bathroom	No	Poor
General Nursing	Acoustic privacy in bathroom	No	Poor
Outpatient Surgical	Acoustical privacy in the registration, preparation, examination, treatment, and recovery areas.	No	Fair

Food and Drug Administration implements and manages the reaccreditation process for many independent laboratories and other covered entities that handle PHI. hematology laboratories, blood banks, pharmaceutical distributors, and other covered entities handle and deal with PHI as an intricate part of there procedural process. Inspections and accreditation procedures for these laboratories are just starting to apply speech privacy standards.

4. DEVELOPING TECHNICAL SPECIFICATIONS AND STANDARDS



Speech privacy in healthcare does not have a single definition, in part because of the variety of spaces and different users’ expectations and privacy needs. For example, the expectation of

speech privacy in a consultation or exam room is different than at a pharmacy counter. Differentiations between use, level of privacy required and the design criteria will need to be quantified. In the design stages, information on the physical and geographical separation of areas of common use throughout the healthcare facility needs to be clear. In the design stages, physical properties of partitions, configuration of floor plans, details about doors, and masking systems have to be easily implemented with current architectural and construction practices. The new standards must be verifiable through measurements in the field after the fact. Existing metrics such as PI, AI, STC, NIC, RC, and NCB must be used to benchmark the effectiveness of the new standards. Here is a list of necessary key areas that need to be addressed in the new standard:

- Scope, purpose and applications;
- Acoustical performance criteria and noise isolation design requirements and guidelines;
- Noise masking criteria for privacy critical or confidential spaces;
- Design guidelines for dearticulation in privacy critical or confidential spaces;
- Rationale for speech privacy criteria;
- “Good architectural practices” and procedures to verify conformance to the standard;
- Potential conflicts between the acoustical requirements of the standard and best management practices in a healthcare setting; and
- Cautionary remarks on using supplemental descriptors for evaluating noise in a healthcare setting.

5. DEVELOPING A BUSINESS MODEL

A. Architectural Design

The most cost-effective and acoustically effective approach to instituting “reasonable safeguards” to ensure speech privacy is by implementing evidence-based design during the planning phases of a new or to-be-renovated healthcare facility. Incorporating key aspects of the developing standards into architectural guidance documents will help ensure compliance. Independent acoustical consultants should be utilized when necessary to interpret and evaluate difficult or conflicting design criteria.

B. Verification and Monitoring

After construction, independent verification must be performed to ensure each critical area meets privacy targets outlined in the newly developing standards. Each room should be measured to verify its actual performance. The verification process is the gold standard in protecting the facility, patients, designer, architects and consultants. It provides a defensible position in the event that a lawsuit or other enforcement action occurs.

HIPAA also requires continuous and ongoing monitoring. A reasonable monitoring schedule may include the independent evaluation of 33% of privacy critical spaces per year. This manages healthcare facilities economic outlays, is realistic to the changes within the spaces and aligns well with the Joint Commission’s standard reaccreditation procedures. All critical areas would be documented monitored at least once within each reaccreditation cycle.

Space verification and the collecting of field data has become a refined process, executed in a reasonable amount of time (about 1 person hour per space). This combined with the magnitude of the healthcare industry lends well to an “economy of scale” business models. All covered entities have similar basic measurement and reporting needs. With approximately 250,000 healthcare clinics in the United States and an average of 20 rooms per clinic measuring 33% of the rooms per year (about 7 per clinic), the resulting cost is estimated at 1.65 million rooms at

\$100 per room, a \$165 million dollar annual industry for the first three-year cycle. This does not include hospitals, pharmacies and other healthcare and non-healthcare covered entities.

C. Troubleshooting

This model also services and compliments the current acoustical consulting and manufacturing markets. Ongoing monitoring would establish an iterative business process uncovering shortcomings which could be addressed by architects, consultants and manufactures of speech privacy devices. Solutions to problems identified in the verification and monitoring process can include modifications to the source, pathway and/or listeners. They would commonly include one or more of the following:

- Create and enforce speech privacy policies (Source);
- Keep staff informed on which areas are, and are not, private (Source);
- Increased absorption in the source room (Pathway);
- Decrease sound transmission characteristics of the walls, ceilings and doors between adjacent spaces (Pathway);
- Implement strategic flow and placement of listeners - Such as staggering patients and never having adjacent treatment rooms occupied (Listener);
- Implementing Room/Need Coding - Limiting “poor privacy” rooms to treatment of superficial cases such as cuts and bruises (Listener); and
- Decreasing the Signal to Noise Ratio (SN) or Masking – De-articulating the remaining speech signal with background noise in the receiving area (Listener).

6. CONCLUSIONS

Speech is the most common form of communication and is a common source for HIPAA incidental disclosure. Many standards, measurement procedures, and definitions exist today that indirectly service healthcare speech privacy needs. As we proceed with a better definition of reasonable safeguards and privacy in general, standards and guidelines for designing, monitoring and remediation are being developed to be directly applied to meet the healthcare industry’s speech privacy needs. A suitable business model already has been developed to service this need.

7. ACKNOWLEDGEMENTS

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8. REFERENCES

1. U.S. Department of Health and Human Services (USHHS), 2003, “Summary of the HIPAA Privacy Rule”, Office of Civil Rights (2003)
2. American Hospital Association’s (AHA), , “Draft 2006 Guidelines for Design and Construction of Hospital and Healthcare Facilities” (2004)