Position of the Academy of Nutrition and Dietetics: Nutrition Informatics

ABSTRACT

It is the position of the Academy of Nutrition and Dietetics that nutrition informatics is a rapidly evolving area of practice for registered dietitian nutritionists and nutrition and dietetic technicians, registered; and that the knowledge and skills inherent to nutrition informatics permeate all areas of the dietetics profession. Further, nutrition and dietetics practitioners must continually learn and update their informatics knowledge and skills to remain at the forefront of nutrition practice. Nutrition informatics is the intersection of information, nutrition, and technology. However, informatics is not just using technology to do work. The essence of nutrition informatics is to manage nutrition data in combination with standards, processes, and technology to improve knowledge and practice that ultimately lead to improved quality of health care and work efficiency. Registered dietitian nutritionists and nutrition and dietetic technicians, registered, are already experts in using evidence to practice in all areas of nutrition and dietetics. To remain at the forefront of technological innovation, the profession must actively participate in the development of standards, processes, and technologies for providing nutrition care.

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POSITION STATEMENT

It is the position of the Academy of Nutrition and Dietetics that nutrition informatics is a rapidly evolving area of practice for registered dietitian nutritionists and nutrition and dietetic technicians, registered, and that the knowledge and skills inherent to nutrition informatics permeate all areas of the dietetics profession. Further, nutrition and dietetics practitioners must continually learn and update their informatics knowledge and skills to remain at the forefront of nutrition practice.

HEALTH INFORMATION TECHnology (HIT) has advanced rapidly since the passage of the Health Information Technology for Economic and Clinical Health (HITECH) Act of 2009. Part of the American Recovery and Reinvestment Act, the HITECH Act incentivized adoption of electronic health records (EHRs) provided they were used to meaningfully improve patient care. At the same time, advances in personal and mobile computing have made it easy for consumers to access health information at all times, from any device. To participate in this technology-rich environment, registered dietitian nutritionists (RDNs) and nutrition and dietetic technicians, registered (NDTRs), must have a working knowledge of computer and information skills. Nutrition informatics is the intersection of nutrition, information, and technology, and it underlies all areas of dietetics practice.[1,2] In addition, RDNs and NDTRs may work exclusively in informatics roles. As reported in a 2014 survey on nutrition informatics, 3% of respondents reported their primary practice area as nutrition informatics.[3,4] It is the position of the Academy of Nutrition and Dietetics (Academy) that nutrition informatics is a rapidly evolving area of practice for RDNs and NDTRs. The knowledge and skills inherent to nutrition informatics permeate all areas of the dietetics profession. Further, nutrition and dietetics practitioners must continually learn and update their informatics knowledge and skills to remain at the forefront of nutrition practice.

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HIT includes the hardware and software used to collect data and information in all health care settings.[5] The computers, handheld devices, monitors, and scanners that are vital in today's fast-paced health care environment are all part of HIT. Much of the software used in health care is also part of HIT. Ensuring that health care providers and systems are able to communicate effectively and share health information is another HIT function. HIT professionals also focus on ensuring that the right person uses the right technology for the right task.

Health care informatics (HCI) is often defined as the process of acquiring, storing, retrieving, and using health care information.[6] HCI uses health care information to create a body of knowledge that can then be utilized to support health care providers in practice. Compared with other areas of health care, HCI is relatively new. HCI is focused not on hardware and software, but on using knowledge acquired through technology to improve quality and safety of health care.

It is important to differentiate between HCI and HIT. Although there are some similarities between HCI and HIT, they are not synonymous. HCI is supported by technology. For example, when clinicians enter patient data into an EHR they are using HIT. HCI ensures that the data entered into the EHR can be utilized to improve health care quality and safety.

HCI is a relatively new field. In 2009, Charles Friedman recognized some confusion related to what informatics was and how to best describe the work of informatics. He defined informatics as use of computers to make humans

work more efficiently. A key component of Friedman's definition is that computers do not replace human reasoning. Friedman's definition makes it clear that although computers are not a requirement for practice in HCI, computers make it possible to manage the huge amounts of data that are created every day in health care organizations.[6]

INFORMATION LITERACY VS COMPUTER LITERACY

Literacy is generally defined as the ability to read, write, and do basic mathematic functions.[7] Information literacy is the ability to know when information is needed as well as to find and effectively use information.[8] RDNs and NDTRs who are computer literate are able to use computer software to accomplish tasks. An example of computer literacy is having the ability to open a spreadsheet application to enter data. Information literacy skills are needed to understand what the data in the spreadsheet represent and how to derive meaning from data. RDNs and NDTRs in all practice settings must be information and computer literate.

Nutrition and HCI have ties to both computer and information literacy.

A BRIEF HISTORY OF EHRs

Before the 1960s, the simplest data processing tasks required computers that were generally the size of a small house. During the 1970s, the size and cost of computers decreased and their computing power increased. Physicians at a few academic medical centers leveraged their interest in computer science to create the first EHRs.[9] However, by the end of the 1970s, with the exception of a select few, hospitals that were using computers continued to use them only for administrative and financial functions.

The early 1980s saw the beginning of the EHR vendor industry along with tremendous growth in the computing power available as the cost and physical size of computers decreased. The first desktop computers were introduced, making it feasible for computers to be used in clinical settings. In 1989, Tim Berners-Lee created the system that would become today's Internet.[10] Although more health care organizations adopted clinical information systems, most EHRs continued to be homegrown systems because the EHR vendor industry was still in its infancy. There was no widespread consensus on the need to implement and use EHRs or other technology in health care.

Publication of *To Err Is Human* and *Crossing the Quality Chasm* in 2000 and 2001 led to increased support for use of EHRs as a means to improve patient safety and quality of care.[11,12] In his 2004 State of the Union address, President George W. Bush called for adoption of EHRs within 10 years.[13] Finally, in 2009, a stipulation in the American Recovery and Reinvestment Act set aside monies that funded the HITECH Act, which was intended to promote adoption and meaningful use of HIT (including EHRs).[14]

HCI

When HCI is understood as the science that manages knowledge related to health care, it is clear that informatics pre-dates use of technology by several centuries. During the 1600s, the London Bills of Mortality provided a mechanism to monitor causes of death during plague outbreaks.[15] In fact, many consider the London Bills to be the precursor to the International Classification of Diseases terminology in use today.[16]

Florence Nightingale and John Snow were early pioneers in HCI. John Snow was a British physician who is credited with being one of the first to use data to improve public health. During a cholera outbreak in London during the 1850s, Snow gathered data that he used to trace the source of the outbreak to a single water pump. During the Crimean War, Nightingale created a system to collect data related to care provided to sick and wounded soldiers. Nightingale then used these data to demonstrate the need to improve health care systems.

The International Classification of Diseases terminology was used to document medical diagnoses for almost 100 years before the appearance of the first computers in health care.[17] In the early 1960s, additional health care terminologies began to appear. During this period, the American Medical Association developed the Current Procedural Terminology to document and bill for physician services. At the same time, the College of American Pathologists recognized the need for a common terminology to describe pathology findings, leading to the Systematized Nomenclature of Pathology, which later became Systematized Nomenclature of Medicine–Clinical Terms (SNOMED CT).[18]

Between the 1960s and 1980s, additional health care terminologies were developed, including the Logical Observation Identifiers, Names, and Codes (LOINC) terminology that is used to code laboratory data and findings.[19] There are now several nursing terminologies, including that of the North American Nursing Diagnosis Association, the Nursing Interventions Classification, and Nursing Outcomes Classification.[20-22]

The practice of HCI has changed alongside the rapid changes in HIT. Standards have been updated, EHRs adopted, and most practice settings now use electronic records and systems for patient care. Still, what underlies successful use of technologies is the effective and appropriate use of standards, terminologies, and processes.

NUTRITION INFORMATICS

The first article on the use of computers in dietetics practice, "Computers in Dietary Studies," was published in the *Journal of the American Dietetic Association* in 1962.[23] This was followed by the first book on the same topic, *Computers in Nutrition*, published in 1979.[24] Just as the overall field of HIT took off at the start of the millennium, so too did the field of nutrition informatics.

In 2003 the Nutrition Care Process (NCP) was created as a "systematic approach to providing high quality care." It consists of four distinct interrelated steps: the nutrition assessment, diagnosis, intervention, and monitoring and evaluation.[25,26] Following the NCP, the Academy's Evidence Analysis Library was launched in 2004.[27] Available to all Academy members, the Evidence Analysis Library offers systematic reviews on a range of topics. Members rely on this resource for up-to-date summaries of the latest research and evidence base for nutrition practice.[28]

Publication of the NCP in 2003 also spurred development of a terminology that was unique to the dietetics

Certification	Certifying or accrediting organization	Profession	Minimum education/training required	Website
Certification in Nursing Informatics	American Nursing Association	Nursing	Bachelor's degree in nursing or relevant field, practice and education in nursing and informatics	www.nursecredentialing.org/NurseSpecialties/Informatics.aspx
Registered Health Information Technician	CAHIIM[a]	Health information management	Associate's degree-level requirements in health information management, as determined by CAHIIM	www.ahima.org/certification/rhit.aspx
Registered Health Information Administrator	CAHIIM	Health information management	Bachelor's degree-level requirements in health information management, as determined by CAHIIM	www.ahima.org/certification/rhia.aspx
Certified Associate in Healthcare Information & Management Systems	HIMSS	Various	High school diploma or equivalent	www.himss.org/health-it-certification/cahims?navItemNumber=13646
Certified Professional in Healthcare Information & Management Systems	HIMSS	Various	Bahelor's degree from accredited institution and 5 y information management experience, at least 3 of those years in a health care setting	www.himss.org/health-it-certification/cphims?navItemNumber=13647
Certified Professional in Healthcare Quality	National Association for Healthcare Quality	Varies	No formal requirements other than suggestion for 2-y experience in a quality setting	https://nahq.org/certification/faqs

Figure 1. Existing certifications in informatics across health care disciplines. [a]CAHIIM=Commission on Accreditation for Health Informatics and Information Management Education. [b]HIMSS=Healthcare Information & Management Systems Society.

Bachelor's degree programs	Master's degree programs
1.13 Applies nutrition informatics in the decision-making process	
1.13.1 Applies technology in the decision-making process	1.13.1 Analyzes data derived from electronic media to make best decisions related to nutrition and diet
1.13.2 Describes factors to consider when accessing and evaluating nutritional health information online	1.13.2 Evaluates accuracy and reliability when accessing and evaluating nutrition information online
1.13.3 Identifies trends in nutritional health and food systems	1.13.3 Designs and/or operates nutrition informatics systems in practice
1.13.4 Uses electronic databases to obtain information	1.13.4 Uses electronic databases to obtain nutrition information and evaluate credible sources in decision making
1.13.5 Proficiently uses technology to enhance practice and services	

Figure 2. Future education model competencies and performance indicators for nutrition informatics.

profession, the International Dietetics and Nutrition Terminology. This terminology has since been renamed the electronic Nutrition Care Process and Terminology (eNCPT) because use of the terminology is integral to following the NCP.[29] The Academy continues to work with experts in health care terminology to map the eNCPT to SNOMED CT and LOINC.

With the push for adoption of EHRs the Academy published an EHR Toolkit in 2008. The EHR Toolkit provides guidance on integrating nutrition care as an EHR system is chosen and implemented. Simultaneous to these initiatives, Academy members began documenting the need for informatics content specific to nutrition within the dietetics profession.[30,31] In 2006, the first request was made for a Nutrition Informatics dietetic practice group. Because there was a paucity of knowledge and no formal definition of nutrition informatics, the Academy formed a Nutrition Informatics Work Group in 2007 to assess and define informatics in the profession. This work group proposed the following definition of nutrition informatics:[32]

> *The effective retrieval, organization, storage and optimum use of information, data and knowledge for food and nutrition-related problem solving and decision making. Nutrition informatics is supported by the use of information standards, processes and technology.*

This definition was approved by the Academy's House of Delegates and following a study of nutrition informatics as a mega issue within the House of Delegates, the Nutrition Informatics Work Group recommended and received designation as the Nutrition Informatics Committee in 2009. The work of the Nutrition Informatics Committee began in 2010, and continues at present. As part of this committee, an Interoperability and Standards Subcommittee was formed in 2011, which became a full committee in 2014. The request for a Nutrition Informatics dietetic practice group was approved for the 2019 membership year.

Ongoing assessment and development of informatics in the dietetics profession continues. The Academy has a close working relationship with HL7, which is a health care standards development organization focused on standards that support provision of safe, high-quality health care. Within this work with HL7, the Academy has developed the Electronic Nutrition Care Process Record System-Functional Profile, which states the functions of dietetics and nutrition practice that should be contained in an EHR system.[33] The Academy has also developed the Clinical Document Architecture Release 2 (C-CDA R2.1) Nutrition Transitions of Care Implementation Guide, another HL7 standard that supports the transfer of nutrition data during transitions among care settings.[33]

To support members, the Academy has published an EHR Toolkit, which is available to members and provides key steps on how to communicate with information technology staff in their setting about RDN and NDTR needs within an EHR.[34] The EHR Toolkit also includes detailed information about HL7, the Electronic Nutrition Care Process Record System, and C-CDA R2.1. In addition, the Nutrition Informatics Committee surveyed Academy membership in 2008, 2011, and 2014 to understand the value of electronic information to nutrition and dietetics practitioners and students in nutrition, to assess changes over time, and to ensure that the Academy is meeting the informatics needs of membership.[4,32,35]

CERTIFICATION EFFORTS AND EDUCATIONAL REQUIREMENTS

Different approaches to making HCI a formal aspect of education and certification have been adopted by various professions. Physicians with expertise in computer science were among the early developers of EHRs. In 2011, it became possible for physicians to be board certified in medical informatics.[36] Nurses comprise one of the largest groups of EHR users in health care.[37] There are several routes available for nurses who want to specialize in nursing informatics. In addition to certification, nurses can also obtain advanced degrees in nursing informatics. At present, many academic institutions offer informatics programs, particularly those that are affiliated with a medical center. In addition, currently available certifications are outlined in Figure 1.

INTEGRATION OF NUTRITION INFORMATICS IN EDUCATION AND PRACTICE

Among the Academy's Council on Future Practice findings in the

Resource	Website
Academy's Informatics in Nutrition Certificate	www.eatrightstore.org/collections/informatics-nutrition
Nutrition Informatics Blog	www.foodandnutrition.org/blogs/the-feed/
Nutrition Informatics: Framework for Dietetics Practice in a Digital World (webinar)	www.eatrightpro.org/resource/advocacy/quality-health-care/hitech-act/nutrition-informatics-framework-dietetics-practice-digital-world

Figure 3. Academy of Nutrition and Dietetics resources for professional development in nutrition informatics.

Visioning Report 2017 is the change driver of technological obsolescence. The Council on Future Practice found the rapid pace of technology change to be disruptive to the practice of health care and dietetics. As health care and nutrition services become automated, offered via mobile applications, or remotely via telehealth, RDNs must be involved in the development of these technologies. As such, the Council on Future Practice recommended that "digital literacy should be a part of the official curriculum to prepare all health care professionals for digital health care technologies."[22,38] In addition to digital literacy, all students and nutrition and dietetics practitioners need to learn how nutrition informatics tools allow RDNs to convert nutrition data and information into the knowledge base of nutrition and dietetics practice.

Nutrition informatics has been integrated into practice standards at the professional level as one of the nine core spheres of practice outlined in the Essential Practice Competencies for the Commission on Dietetic Registration's Credentialed Nutrition and Dietetics Practitioners.[39] Sphere five states that RDNs and NDTRs "use technology to retrieve, interpret, store and disseminate information in an accurate, professional and ethical manner for the delivery of nutrition and dietetics service."[39,40] This sphere is further broken down into four competencies each with performance indicators. The Commission on Dietetic Registration also provides practice illustrations as examples of actions or skills that demonstrate competency.

The Accreditation Council for Education in Nutrition and Dietetics did not include nutrition informatics in the 2017 didactic competencies, and at the internship level there was one competency, CRDN 4.4: Apply current nutrition informatics to develop, store, retrieve, and disseminate information and data. However, nutrition informatics has been included in the Future Education Model at the bachelor's degree and master's degree levels. (See Figure 2 for these competencies.[41])

The Academy has provided several resources for continuing professional education in nutrition informatics (see Figure 3). Among these, the nutrition focused American Medical Informatics Association 10×10 course was offered online each with a culminating experience at the Academy's annual Food & Nutrition Conference & Expo. Initially offered in 2010, this course covered 12 units of informatics content, with nutrition informatics content included where appropriate. To date, 129 students have completed the course.[4]

The Academy's Center for Lifelong Learning has published five modules that together comprise a Certificate of Training in Informatics in Nutrition and provide 10 hours of continuing professional education credit. The topics are:

- Overview of Informatics at the Academy: Academy Resources and Tools;
- Data Follows the Patient: Interoperability, Patient Generated Data, Protected Health Information, Security, and Ethics;
- Communications: Current Capabilities and Future Endeavors, Social Media, Telehealth, the Direct Project, and Blue Button;
- Nutrition in Electronic Health Records and Health Information Technology; and
- Analytical Skills: Data Big and Small.

Members are encouraged to read archived posts in the Nutrition Informatics blog, The Feed.[42] This blog was tailored to provide brief, approachable examples of how RDNs and NDTRs are using informatics in daily practice, written by Academy members who have experience in nutrition informatics.

The Nutrition Informatics Committee and the Interoperability and Standards Committee have worked since 2010 and 2014, respectively, to promote the inclusion of nutrition terminology in HIT standards and to educate nutrition and dietetics practitioners about nutrition informatics. The history and importance of this work was presented in a webinar on April 4, 2017, and the recording is available at eatrightpro.org. Academy members may receive 1 hour of continuing professional education credit for viewing this recording.

FOCUS ON NUTRITION INFORMATICS AND AREAS OF PRACTICE/INFORMATICS RESOURCES AND THE ROLE OF RDNs IN EACH AREA OF PRACTICE

The textbook example of nutrition informatics in practice begins with use of data collected in EHRs to document the effectiveness of medical nutrition therapy. The harmonization of standards, terminologies, and processes is best demonstrated by RDNs who document provision of care using the eNCPT in their organization's EHR. The user-facing eNCPT terms would then be mapped to federally mandated standard terminologies—SNOMED CT and LOINC—to enable the sharing of data with other providers and for quality reporting measures. This scenario provides interoperable data that are available for patient care across health care settings. RDNs may participate in process analysis or workflow redesign for EHRs as part of nutrition informatics practice and they may be involved in mapping terminologies to support interoperability.

Data that are recorded in the manner described here support the collection of electronic clinical quality measures that utilize data extracted from EHR systems to evaluate the quality of care provided. These measures are

paramount to documenting the effectiveness of nutrition interventions. This last step, analyzing the data that have been collected, is completed by expert nutrition informaticians.

Beyond EHRs, nutrition informatics permeates all areas of practice.[1] Complex software programs support timely and efficient provision of foodservice in hospitals and schools. Mobile apps enable consumers to track their food intake, exercise, blood glucose values, and other health outcomes in great detail, and share that information with their providers. Given the volume of data produced by these systems, RDNs with expertise in nutrition informatics can facilitate development of filters that present relevant information to providers at the point of service.

Increasing numbers of higher education courses are available online, and educators may use learning management systems, learning simulations, or mobile apps to reach their students. Database design and management are essential in nutrition and dietetics research as practitioners collect information about research participants using clinical trial management systems. As the field of gene–diet interactions matures, big data solutions will be needed to parse the influence of dietary intake on the genes at an individual level.

RDNs working in public health settings are key users of nutrition information to ensure the health of the communities they serve. Data from social media can be used to predict and track foodborne disease outbreaks. RDNs in public health can rapidly find the information needed to direct communities to safe food resources following natural disasters. Program development is facilitated by use of nutrition information found in databases.

Whereas informatics is used in all areas of practice, it is also recognized by the Academy as an area of practice.[4] RDNs and NDTRs who practice in informatics may work on the development teams for food and nutrition software applications or mobile apps, or work as clinical data analysts in a health care setting.

ETHICAL, LEGAL, AND SOCIAL ISSUES

Health Insurance Portability and Accountability Act (HIPAA) regulations mandate the privacy and confidentiality of protected health information and apply to covered entities. Covered entities are defined as "health plans, health care clearinghouses, and health care providers who electronically transmit any health information in connection with transactions for which [the US Department of Health and Human Services] has adopted standards."[41] Many RDNs in clinical practice will find themselves working for a covered entity and will be subject to the requirements of HIPAA. Regardless of practice setting, all RDNs and NDTRs must abide by the Code of Ethics for the Profession, which states: "Respect patient/client's autonomy. Safeguard patient/client confidentiality according to current regulations and laws."[43]

In the modern, digital age, protecting confidential information is more complex than keeping hard copy records in a locked office. Data stored in computer systems are vulnerable to hacks and hardware failure, and must be secured and backed up so that important details of a patient's care are not lost. With proper practices in place to safeguard and backup patient data, the benefits of electronic records outweigh the risks.

Practitioners who provide telehealth services by counseling over video conference should engage the services of a third-party provider who will agree to a business associate agreement. A business associate agreement or business associate contract is a contract that binds the service provider to all of the provisions of HIPAA, which protects patient privacy and confidentiality for all data transferred via video conference to the third party.[44] Free services such as Facetime and Skype do not have business associate agreements in place with users, and are not secure methods of providing telehealth services. When sending electronic messages, best practice is to use a secure online portal for sending and receiving messages from patients and clients. Even when a practitioner uses a secured e-mail server, the recipient of the messages may not use a secure service, and confidential information may be at risk. Any devices used to store or transmit patient data should be encrypted so that in the case that the device is lost the data will not be vulnerable. Free encryption programs are available for Windows, Mac, and Linux operating systems.

THE FUTURE OF NUTRITION INFORMATICS

Although EHRs are now prevalent in hospitals across the country, information-sharing standards have yet to be successful in allowing information to follow the patient across the continuum of care. Those RDNs and NDTRs who practice in nutrition informatics have an even greater call to action to help close this gap in interoperability.

RDNs and NDTRs are rising to the challenge. Comfort level with using electronic data has increased in each of the nutrition informatics surveys conducted, along with the percentage of respondents who access data electronically.[4] Survey respondents most often considered themselves expert in nutrition assessment, nutrition histories, and nutrition screening.[3]

As demonstrated by the history of informatics in health care, the need to collect and interpret information to gain knowledge and improve practice is centuries old. The recent change is the increase in the volume of information that must be dealt with. The volume of medical knowledge has far exceeded human capacity, and requires informatics solutions to navigate and apply. The doubling time of medical knowledge in 1950 was estimated at 50 years. By 2020, the doubling time of medical knowledge is expected to shrink to just 73 days.[45]

The Academy has worked to meet demands for information through the creation of the Academy of Nutrition and Dietetics Heath Informatics Infrastructure (ANDHII).[46,47] The purpose of ANDHII is to document the efficacy of nutrition care and to add to the evidence base essential to the practice of nutrition and dietetics. This web platform enables RDNs and NDTRs to document nutrition interventions in an easy to use, free platform. Practitioners can document their patient outcomes and contribute to the National Quality Improvement Pool dataset, or request a unique project to track outcomes for quality improvement or research. The data collected in ANDHII through the Dietetics Outcomes Registry can support policies for provision and reimbursement of nutrition services in health care. These efforts are of particular

importance because although machine learning—the use of computers to complete complex data analysis—has taken off in other industries, it has not yet been successfully applied in the remarkably complex world of medicine.[48]

RDNs and NDTRs must continually maintain and update their informatics skill and knowledge, especially as the health care industry moves from a volume-based to a value-based environment. In this new paradigm, nutrition becomes more prominent as both a preventive and therapeutic solution. Equipped with ANDHII and other means of tracking patient outcomes, RDNs and NDTRs will be able to demonstrate the efficacy and importance of their expertise and interventions. Beginning June 2019, RDNs and NDTRs will also have the option of joining the Nutrition Informatics dietetic practice group, which will emphasize educational opportunities for members and expand on the work done by the Nutrition Informatics Committee.

Whether examining the effects of malnutrition in a clinical setting or working to improve food systems for sustainability, the challenges facing the dietetics profession are global and interconnected in nature. For these and other challenges facing the profession, informatics standards and processes are required to document and track effective solutions. A growing number of RDNs and NDTRs have expertise in nutrition informatics, and all can access training and support from the Academy. Knowledge and skill in nutrition informatics better equips RDNs and NDTRs in all areas of practice to be successful.

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Authors: Sarah Rusnak, MS, RD, LD (The Ohio State University, Columbus, OH); Pamela Charney, PhD, RD (University of North Georgia, Dahlonega, GA).

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