The Value of the Clinical Narrative in Cancer Care

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Jerry Henderson, Physician Informaticist, MD Anderson Cancer Center
Michael Clark, SVP & General Manager, Nuance Healthcare
Conflict of interest

Jerry Henderson, MD
Has no real or apparent conflicts of interest to report

Michael Clark
Has no real or apparent conflicts of interest to report
Agenda

• Learning objectives
• MD Anderson profile
• Capturing patient stories in cancer care
• Patient story examples in different medical record formats
• Outcomes
• Nuance profile and partnership with MD Anderson
• Evolution of speech recognition in healthcare
• Best practices
Learning objectives

• Describe the impact of the historical narrative to the cancer patient healthcare care experience

• Discuss emerging voice, data/image sharing and clinical intelligent technologies in capturing and preserving the unstructured patient story

• Recognize initiatives at MD Anderson, the country’s leading cancer center, to enable the patient medical narrative in the EHR as a method to connect providers to patients and improve upon cancer care
MD Anderson profile

• Jerry Henderson, MD MBA
• Physician for 13 years at MD Anderson Cancer Center Emergency Center (one of a kind)
• Physician Informaticist to the CMIO, CIO and Associate CMIO
• Developed and implemented electronic documentation software for the ER, which was the documentation tool for about five years
• Led the clinical content and template design for conversion to Epic
• Assisted in the rollout of Nuance Dragon Medical for the institution
• Led the conversion of the existing free-text problem list to Epic using natural language processing

Source: MD Anderson Cancer Center
MD Anderson statistics for 2016

- 1,101 active clinical research protocols
- $736,193,430 spent on research
- $4.4 billion total institutional revenue
- 50 buildings in the greater Houston area, with over 14 million square feet (1.3 million square meters)
- 19,973 employees
- 1,685 faculty members
- 27,761 hospital admissions
- 654 inpatient beds
- 1,363,008 outpatient clinic visits, treatments and procedures
- 12,005,766 laboratory medicine procedures
- 523,297 diagnostic imaging procedures

Located in Houston Texas, MD Anderson’s mission is to eliminate cancer through innovative therapies working within a patient-centered multidisciplinary environment. We are the largest single cancer-focused facility in the free world.
Dear Trevor, I hope I’m around when you open this! Because I will or would have been 79 years old! Today we had a total eclipse, and the next one is in the year 2017 so I thought this was such a special day in the first year of your life that I would make a note of it to you since you are too little to understand any of it. I wonder what you will be doing at the age of 26! I do know that you are the cutest baby ever and we love you lots and love having you over to stay with us, you are so much fun! I must get back to work now, I’m giving this to your mother this weekend to put away until 2017 when you are to open this.

Love you, grandma Betty
Letter from grandma 26 years ago

- **Age:**
  - Author: 79
  - Reader: 26
- **Event:** Eclipse, Total
- **Diagnosis:** Baby, Cutest (ever) 526.00
- **History:**
  - Stayed with us: Yes
  - Fun to be with: Yes
- **Follow up with:** Mother, 2017
What is the purpose of the medical record?

1. Communication tool
2. Medical-legal document
3. Billing and coding system
4. Regulatory compliance tool
5. Data collection mechanism
Storytelling as an art form

• Primary method of passing on ideas for millennia
• As a skill for medical staff
  – Medical students
  – Nursing
  – Psychiatrists
  – HIMSS

Importance of patient stories in cancer care

- Why does MD Anderson make patient stories a priority?
  - Patients become more than a number
  - Closes gaps in patient care
  - Connects discrete events in a meaningful way
  - Patient satisfaction
  - Provider satisfaction
  - Narrative story telling is particularly important in chronic diseases
How does MD Anderson capture the patient story?

- EHR
- Voice-to-text in clinic and at the bedside
- Voice-to-text in radiology/oncology imaging
- Provider and patient mobile technologies
- Open notes EHR portal
- Simulation training
- AI, clinical decision support tools
How do we use patient stories in cancer care?

Source: MD Anderson
How do we use patient stories in cancer care?

Source: MD Anderson
How do we use patient stories in cancer care?

Source: Epic, MD Anderson
Example: A patient story in a template

Patient is a 66 y.o. female presenting with diarrhea and vomiting. History provided by: Patient
Diarrhea
Quality: Watery
Severity: Severe
Number of episodes: Too many to count
Onset quality: Gradual
Duration: 72 hours
Timing: Constant
Relieved by: Nothing
Worsened by: Nothing tried
Ineffective treatments: None tried
Risk factors: recent chemotherapy
Risk factors: no abdominal mass, no stem cell transplant, no radiation treatment, no immunosuppression, no hx of C Diff, no recent antibiotic use, no sick contacts, no suspicious food intake and no travel to endemic areas
Associated symptoms: abdominal pain and vomiting
Associated symptoms: no arthralgias, no chills, no recent cough, no diaphoresis, no fever, no headaches, no myalgias, no URI, no dysuria, no incontinence, no anorexia and no rectal pain

Abdominal pain:
Location: Generalized
Quality: Aching
Pain scale: superficial muscular tenderness.
Onset quality: Gradual
Duration: 3 days
Timing: Constant
Progression: Waxing and waning
Chronicity: New
Vomiting:
Quality: Stomach contents
Number of occurrences: Too many to count
Severity: Severe
Duration: 48 hours
Timing: Constant
Progression: Unchanged
Vomiting
Associated symptoms: abdominal pain and vomiting
Associated symptoms: no constipation, no fever, no chills, no headache, no arthralgias, no myalgias, no cough and no URI
The same example in prose

This pleasant 66-year-old female who is getting treated for pancreatic cancer with chemotherapy complains of not being able to keep anything down for the past 3 to 4 days. She also tells me that she has abdominal pain and diarrhea. She has been receiving FOLFOX chemotherapy, and her last dose was one week ago which correlates well with the onset of her symptoms. She denies any recent fever.
Mrs. History is a 78 y.o. female with history of new diagnosis of high grade serous adenocarcinoma of the peritoneum. Dr. Patience had a discussion with the patient and her family regarding treatment. I have reviewed Lab/Imaging/Path. The results of all laboratory and/or radiographic studies were reviewed at length with the patient. The patient was provided with copies of these reports. The patient was instructed to report to the ER in the event of any acute issues.

Moments later the patient arrived in the ER with a blood pressure of 88/95 and pulse of 115.

What was the real the story?
Note template design at MD Anderson

Six core note types created

All note templates were built using one of these core designs

Clinicians on the design team demanded free text for storytelling
History of Present Illness:
Patient is a 44-year-old male with lung cancer. He is currently receiving treatment with Pemetrexed, carboplatin, and bevacizumab chemotherapy. He began with shortness of breath 24 hours ago. His wife reports that he was getting out of the shower at the time and appeared exhausted and "red". She could hear him wheezing audibly and the patient collapsed to the floor. He was brought to the ED and found to have Thoracic outlet syndrome. He was admitted to the inpatient service for radiation therapy.
Patient: Thor O. History
MRN: 555555
Age: 73
Hospital Day: 8

Tuesday, September 30, 2014

Chief Complaint: Pain in the right leg.

Interval History: Patient is recovering from radiation therapy for Thoracic outlet syndrome quite well. Last night he developed some left leg pain and we will investigate further.

Review of Systems:
1. Shortness of breath
2. Left leg pain

Exam:
BP: 98/47, P: 103, RR: 18, Temp: 36.8°C, SpO2: 88% on Room Air
General: Toxic Appearing Pale.
Neuro: Oriented x 3, Drowsy.
Eyes: PERRL.
HEENT: Dry Mucus Membranes.
Cardiovascular: Regular rhythm, Tachycardia.
Lungs: Rhonchi.
Lymphatics: No peripheral edema.
GU: No suprapubic tenderness.
Skin: Warm, Dry. No rashes present.
Musculoskeletal: Neck supple.

Source: MD Anderson
Discharge summary template

Source: MD Anderson

**Patient:** Thor O. History  
**Age:** 73

**MRN:** 272275  
**Hospital Day:** 8

**Date/Time of Admission:** Friday, September 19, 2014  01:10am  
**Attending:** Dr. Minny Patience

**Date/Time of Discharge:** Thursday, October 2, 2014  12:15pm

**Reason for Hospitalization:** Thoracic outlet syndrome

**Care, Treatment, and Services Provided:**
This gentleman was admitted to the hospital after experiencing shortness of breath and collapse at home. He was found to have classic outlet syndrome and was treated with radiation therapy hospital. He responded quite well and symptoms resolved. During hospital visit he developed lower extremity swelling which was evaluated by ultrasound and found to be negative. The patient will be discharged home and will follow up and clinic within seven days.

**Procedures Performed During the Hospital Stay:**
1. CT thorax with contrast  9/19/2014.

**Consults Performed During the Hospital Stay:**
1. Pulmonary Medicine consult requested

**Condition at Discharge:** Stable  
**BP:** 98/47  
**HR:** 103  
**RR:** 16  
**Temp:** 36.8°C  
**SpO2:** 88% on Room Air

**Updated Medication List**
1. Avlocox 400mg. Take 1 tablet orally daily for 7 days. Dispense 7 (Seven).
2. Albuterol 90 micrograms/spray MDI. 2 puffs inhaled q 6 hours pm shortness of breath, dispense one unit.
3. Hydralazine, take 5mg, po q 4 hours pm cough. Dispense one 180mg bottle.
4. Lovenox 60mg, inject 60mg subcutaneously q 12 hours, dispense 14 (fourteen), no refills.
Patient transfers and outside records

- Clear concise communication is key
- Summary statement is very useful
- Sick patients may not be able to communicate
- Minimizes patient inconvenience
- Maximizes patient trust

The outcomes at MD Anderson

• HIMSS Level 6
• Physicians are able to tell patient stories
• Patients are empowered to participate
• Physicians are engaged and more efficient
• Gaps in care are eliminated; handoffs improved
• Improved turnaround time has accelerated the pace of care and eliminated transcription
Remember the original purpose & 1:Many

1. Communication tool
   2. Medical-legal document
   3. Billing and coding
   4. Regulatory compliance
   5. Data collection

Improving the narrative and AI moves the patient story from ‘accurate’ to ‘right’ for all stakeholders

AI, when applied, enables appropriate communication as a byproduct of the physician’s documentation to interested constituents #2-#5 …while liberating the provider to deliver accurate documentation that’s ‘right’ for ALL interested stakeholders

   – Timely
   – Efficiently
   – In workflow

Learning Objective #2 - Explore emerging voice, data/image sharing and clinical intelligent technologies in capturing and preserving the unstructured patient story
“Nuance has been using machine learning as the core of its technologies since its inception and harnesses artificial intelligence in their core platform for not only accurate speech-to-text, but also content extraction. That's going to drive the next revolution where we begin to have autonomous agents analyzing features and building patient records.”

– Dr. John Frenzel, CMIO, MD Anderson Cancer Center
How AI scales and improves Computer-Assisted Physician Documentation’ (CAPD)

CAPD-capturing the narrative with embedded AI of more than 300 million patient stories each year

Clinical approach, content and expertise
Deeply embedded and integrated with EHRs

# of Sites | # of active Providers | Avg. # of encounters processed per month | Avg. Physician Acceptance Rate
---|---|---|---
45+ | 1,500+ | 20,000+ | 75-78%

# of Sites: Growing monthly with Enterprise wide deployments

©HIMSS2018
Sample AI outcomes

36% ↓ Average reduction in CDI/Coding queries by using embedded AI measured from several clients

14% ↑ Increase in Comorbidity and Complication capture measured with embedded AI

Physicians spend on average 15 minutes reviewing a query

Note: AI can add a Major Comorbidity and Complication or a Comorbidity and Complication, which affects DRG, but in some cases there is not a change to DRG or reimbursement as other conditions have already placed the patient into the appropriate DRG.

Results noted above are not on top of an existing CDI program and were focused on physicians with a high number of queries.

Source: Data analysis conducted by Nuance Healthcare Outcomes Deployment Team. January 2018.
AI delivering unmatched outcomes

More accurate documentation and improved hospital quality ratings

Quality and Compliance
- Overall shift in capture of SOI and ROM from Minor/Moderate to Major/Extreme
- 36% improvement in capture of Extreme SOI
- 24% improvement in capture of Extreme ROM

Clinician Satisfaction
“As a physician, I think the real value of the solution is that it’s not disruptive. If you are going to ask a question to clarify something ask me when I’m in the note, not an hour or a day later. If I’ve moved on, the question is an interruption in my day”
-- Dr. Ehab Hanna, CMIO, Universal Health Services

## Evolution of AI in healthcare

<table>
<thead>
<tr>
<th>Solve complex problems</th>
<th>Ambient Clinical Intelligence</th>
<th>Now</th>
</tr>
</thead>
<tbody>
<tr>
<td>Virtual Assistants</td>
<td></td>
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</table>

<table>
<thead>
<tr>
<th>Understand what is meant</th>
<th>Deep Learning and Neural Nets, Algorithms</th>
<th>2005-present</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clinical Language Understanding</td>
<td></td>
<td></td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Understand what is expressed</th>
<th>Speech Recognition</th>
<th>1990-2005</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interactive Voice Response</td>
<td></td>
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Source: Nuance Communications, Inc.
SUBJECTIVE: Patient states that she is feeling worse today

OBJECTIVE:
Vital signs: BP 90/40, P 112, T 38.5, R 24
General: Slightly increased lethargy and GCS of 13-14
Chest: Bilateral wheezing and egophony. CXR shows bilateral infiltrates
Cardiovascular: Normal heart sounds, no murmurs appreciated
Labs: MRSA positive. 24% bands. Creatinine 2.1. Glucose 290, Serum bicarbonate 12, Potassium 4.0

ASSESSMENT:
MRSA pneumonia. Type II diabetes mellitus uncontrolled with diabetic nephropathy with DKA.
Evidence in this patient’s visit record supports a diagnosis of Severe Sepsis.

PLAN:
Continue medical therapy with IV Vancomycin. 1 L fluid bolus with more aggressive monitoring and continue insulin

Clinical facts are extracted from the narrative, tagged to appropriate terminology, and presented in the workflow.

Automatic adjudication identifies and resolves conflicts or duplicates with existing items on problem list.

Physicians can instantly review/add diagnoses, medications, and allergies, to the problem list, hospital problem list, current visit diagnosis list, past medical history, and other lists.

Source: Screen shot Epic EHR. February 2018.
The impact of services

• How services drive success
• Why services are critical and why it is important to wrap services around technology
• How services drive adoption, usability, and outcomes
  – Better provider experience
  – Optimized and utilized EHR
  – Quality integrity
  – Financial integrity
How speech improves the narrative

Clinician productivity and time spent on documentation
(Avg. 1,900 Lines/Month of Clinical Documentation Burden or ~40 Charts)

Speech improves the narrative

- Physicians spend less time actually documenting, while producing more “lines per hour”
- From ‘scratch typing/ keyboard entry’ to ‘speech’ reduces time by on avg. to 3 hours/month
- Actual ‘lines/hour’ from 187 to 635 LpH 3x increase

Sample size
- DMO - 83K clinicians, 194M transactions
- Transcription – 2B transactions
- Typing – ratatype.com

Source: EHR – NCBI, Journal of Graduate Medical Education study at New York Methodist Hospital and Epic PEP reports.
How speech improves the narrative

Speech improves the narrative

- ‘Speech’ v. ‘Transcription’ – the speech narrative demonstrates a larger narrative
- 23% more clinical documentation generated through speech v. traditional transcription

Source: EHR – NCBI, Journal of Graduate Medical Education study at New York Methodist Hospital and Epic PEP reports.
Provider survey on benefits of speech

Over 2,000 physicians surveyed on what’s important when it comes to speech as an input
- ‘easier to capture complete patient story’
- ‘improves quality of documentation’
- ‘easier to document in the EHR’
- ‘improves overall experience with the patients’

<table>
<thead>
<tr>
<th>Clinicians agree that Dragon Medical...</th>
<th>Overall Rating 1 (Strongly Disagree) to 5 (Strongly Agree)</th>
<th>Strongly Agree</th>
<th>Agree</th>
<th>Neutral</th>
<th>Disagree</th>
<th>Strongly Disagree</th>
<th>% Agree + Strongly Agree</th>
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</thead>
<tbody>
<tr>
<td>Makes it easier to capture complete patient story</td>
<td>4.59</td>
<td>58%</td>
<td>34%</td>
<td>7%</td>
<td>1%</td>
<td>0%</td>
<td>92%</td>
</tr>
<tr>
<td>Helps improve quality of clinical documentation</td>
<td>4.44</td>
<td>54%</td>
<td>35%</td>
<td>10%</td>
<td>1%</td>
<td>0%</td>
<td>89%</td>
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<tr>
<td>Enables documentation in a timely manner</td>
<td>4.57</td>
<td>58%</td>
<td>33%</td>
<td>7%</td>
<td>1%</td>
<td>0%</td>
<td>91%</td>
</tr>
<tr>
<td>Makes it easier to document patient care in the EHR</td>
<td>4.60</td>
<td>57%</td>
<td>35%</td>
<td>7%</td>
<td>1%</td>
<td>0%</td>
<td>92%</td>
</tr>
<tr>
<td>Helps improve overall experience with patients</td>
<td>3.70</td>
<td>41%</td>
<td>33%</td>
<td>22%</td>
<td>2%</td>
<td>0%</td>
<td>74%</td>
</tr>
<tr>
<td>Helps reduce frustration/burnout caused by EHR/admin burdens</td>
<td>3.94</td>
<td>43%</td>
<td>36%</td>
<td>18%</td>
<td>3%</td>
<td>0%</td>
<td>79%</td>
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<tr>
<td>Satisfied with accuracy of Dragon</td>
<td>4.58</td>
<td>53%</td>
<td>38%</td>
<td>7%</td>
<td>1%</td>
<td>0%</td>
<td>92%</td>
</tr>
<tr>
<td>Satisfied with overall performance of Dragon</td>
<td>4.59</td>
<td>53%</td>
<td>39%</td>
<td>7%</td>
<td>0%</td>
<td>0%</td>
<td>92%</td>
</tr>
<tr>
<td>Training received helps improve efficiency with Dragon</td>
<td>4.85</td>
<td>71%</td>
<td>26%</td>
<td>3%</td>
<td>0%</td>
<td>0%</td>
<td>97%</td>
</tr>
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Source: Nuance Communications user surveys
Best practices

• Enable the patient narrative with voice recognition technology in the EHR
• Engage patients in the narrative at the point-of-care
• Identify gaps in care. Bridge the growing gap between structured, evidence-based patient information and practice
• Look for ways to embed patient narrative with AI to identify gaps in care
• Expand the role of the radiologist; eliminate transcription
• Seek to improve documentation and include narrative notes
• Conduct simulation training with physician and patients
• Continuous education and training
Questions?

Jerry Henderson, MD, MD Anderson  
JHenderson@mdanderson.org  
linkedin.com/in/jerryhendersonmd/

Michael Clark, Nuance Healthcare  
Michael.clark@Nuance.com  
linkedin.com/in/michael-clark-7536b44