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Case based learning series - Friday noon conference
February 26, 2016

Monthly noon conferences on last Fridays
A GME presentation
DISCLOSURE

- No financial conflict of interest
- All slides and interactive questions are prepared by authors
OBJECTIVES

- Emphasize how Sherlock Holmes’s methods may aid a diagnostic process
- Learn about collection and interpretation of relevant clinical evidence
- Learn various methods to analyze clinical data using detective work analogy
- Utilize case-based learning using actual patient-based examples
- Answer audience questions
- An interactive presentation
DISCLAIMER: LET ME JUST SAY UPFRONT

- Holmesian methods may not be able to solve any or all or many clinical scenarios (some medical scenarios may not have a clear cut solution)

- Purpose of this presentation is to inject some **humor** using a fictional character and his methods to learn some serious principals of clinical medicine
Clinical problem solving is a pure detective work. The search for the root causes of a symptom is like the search for the perpetrator of a crime. So Sherlock Holmes' perspective is insightful.
WE WILL TRY TO COMPARE AND CONTRAST CLINICAL METHODS WITH HOLMES’ CRIME SOLVING METHODS
LET THE FUN BEGIN
I HAVE NEVER HEARD OF SHERLOCK HOLMES

1. Yes
2. No
3. Do not know

8% 92% 0%
WHO WAS THE CREATOR OF SHERLOCK HOLMES CHARACTER?

1. Blake Edward
2. Agatha Cristie
3. Sir Arthur Conan Doyle
WHAT PROFESSION IN YOUR OPINION BEST DESCRIBES SIR ARTHUR CONAN DOYLE

1. Physician
2. Scientist
3. Detective
4. All of above
HAVE YOU USED SHERLOCK HOLMES’S METHODS IN CLINICAL MEDICINE?

1. Yes
2. No
3. Do not know
DID YOU EVER DREAM OR WISH OF HAVING DETECTIVE (CLINICAL) SKILLS SIMILAR TO SHERLOCK HOLMES

1. Yes
2. No
3. Do not know
DO YOU GET ANY INTELLECTUAL PLEASURE WHEN YOU REACH THE RIGHT DIAGNOSIS FROM CLINICAL REASONING

1. Yes
2. No
3. Do not know
“I observe everything”.

“From what I observe, I deduce everything”.

“When I've eliminated the impossible, whatever remains, no matter how improbable it might seem, must be the truth”
A process of reasoning leading to a conclusion based on premise presented.

As long premises are correct, conclusion can not be wrong.
HOLMESIAN DEDUCTION AND OTHER METHODS

- Is it applicable to clinical medicine?
- Is it possible to lead to a right diagnosis based on symptoms, clinical examination and testing data and achieve good outcome
- Think of how Sherlock would solve this mystery

"What would Sherlock do"
CLINICAL MEDICINE: ART OF DEDUCTION

- A process of researching symptoms, signs, and test results leading to a conclusive diagnosis based on data presented.
- As long data is collected and interpreted in right clinical context, it is possible to reach correct conclusion (diagnosis).
- (Of course!!! not yet tested in randomized clinical trial)
<table>
<thead>
<tr>
<th>Sherlock Holmes</th>
<th>Modern health provider</th>
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</thead>
<tbody>
<tr>
<td>Art of deduction</td>
<td>Art of medicine</td>
</tr>
<tr>
<td>Evidence based crime solving</td>
<td>Evidence based medicine</td>
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<tr>
<td>Crime detective</td>
<td>Clinical detective</td>
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<tr>
<td>Convergent thinking</td>
<td>Mixed convergent and divergent thinking</td>
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<tr>
<td>Always finds a solution to a case</td>
<td>Always tries to find a solution to a case</td>
</tr>
<tr>
<td>Despite being very elaborate and realistic, eventually bound by the imagination of a single author</td>
<td>Real life scenarios are multifaceted and not bound by one’s imagination</td>
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<tr>
<td>Will find a way out of “Kobayashi Maru” (He may use lifeline to call Captain Kirk)</td>
<td>Periodic “Kobayashi Maru” situations (No win scenarios)</td>
</tr>
<tr>
<td>He is the only real Sherlock</td>
<td>Trying to be like Sherlock</td>
</tr>
</tbody>
</table>
Detective work – discuss today

For future talks
- Ciphers
- Finger prints
- Foot prints
- Hand wirings
DETECTIVE WORK
Let's poll the audience

What is the biggest concern you have as a clinician when facing a new clinical situation?
DETECTIVE WORK: SHERLOCK SEQUENCE

Research
- Observe
- Gather adequate data

Deduce
- Ciphers, footprints, finger prints etc
- Hypothesis based on data

Solution
- Follow Scientific methodology
- Successful resolution
DETECTIVE WORK:

- Holmes' convergent method of reasoning backwards focuses on conducting research, making observations, and gathering data from a situation.
- Holmes' deductions, based on his observations, are his hypotheses.
- His theories always fit the facts he has observed without any bias.
- "Observe, then Deduce" methodology is true to the Scientific Method.
CONVERGENT THINKING

Data 1

Data 2

Data 3

More data

Solution
CONVERGENT THINKING: BUYING A CAR

- Many choices
- But need only one that fits your needs
- Once you buy it
- Problem is solved
- Enjoy your car
CONVERGENT THINKING

**PROS**
- Start with data
- Ends with a solution
- Solves the problem
- Less confusing

**CONS**
- May miss out on options
CONVERGENT THINKING IN MEDICINE: HOW TO DIAGNOSE A PNEUMONIA

Pneumonia

Fever

Cough

Leukocytosis

Pneumonia
DIVERGENT THINKING: HOW TO DETERMINE CAUSE OF COUGH

Cough
- Pneumonia
- Cancer
- Many other
- Allergy
- COPD
- Fibrosis
CLINICAL DETECTIVE WORK: DIVERGENT THINKING

- Make a list of possible diagnoses – differential diagnosis.
- Systematically eliminate many possibilities – until left with one diagnosis that fits
- Whatever remains must be the proper diagnosis, even if it is a rare disease or a rare manifestation of a common disease.
- Does not always work
- Often the risk of diagnostic procedures is not justified leaving unconfirmed diagnosis
- Empirical treatment of multiple unconfirmed diagnoses based on symptoms
**Divergent Thinking**

**Pros**
- More options
- More choices

**Cons**
- Overwhelmed by choices
- Takes too long
- May never solve the problem
DIVERGENT THINKING: IN MEDICINE

- Common in clinical medicine
- Not paying attention to adequately research the symptoms and physical findings
- Results in very broad differential diagnosis which needs lots of testing
- Takes longer time
- Conflicting data on test results – difficult interpretation
- Reduces chance of findings the real cause
IN MY MEDICAL SCHOOL

✘ A medical student can non stop recite about 90 causes of hemoptysis
✘ Great for exams
✘ Great for impressing your teacher
✘ Almost a hero

IN CLINICAL PRACTICE

✘ How would you rule out 89 D/D in timely manner to determine that the 90th was the right diagnosis
✘ Recipe for thought paralysis
✘ Better idea:
   ✤ What would Sherlock do?
TAKE HOME MESSAGE

- Any one can look up the causes of a symptom in a textbook or on internet phone.

- More valuable clinical skill is to find out precise cause of a symptom in a particular patient.
CASE 1: HYPERCALCEMIA
FAILED DIAGNOSIS.. SO FAR

- A 84 year old female NH resident
- Change in mental status, not eating, dehydration
- PMH: High calcium and back pain a month ago – resolved after IV hydration – no work up done
- Coronary disease, diabetes mellitus, COPD, hypothyroidism, renal dysfunction, atrial fibrillation
- FH: NA
- Exam: Lethargic, cachectic
- Medications: 14 medications
CASE 1: LABS

- CBC normal
- Protein normal
- Elevated ACE level
- Elevated CEA: 21.3 and 21.6
- Low sodium – 13
- Calcium 15.3 → 9.5 in few days after Pamidronate in IV saline
- Intact PTH low at 7.
- Phos normal
- Vitamin D – high at 82
- PTrP normal
- Renal dysfunction – creatinine 1.9
- SPE: No M protein
CASE 1: X-RAYS

- CT chest: Non specific tiny lung nodules – too small to biopsy – decrease compared to before
- CT abdomen and pelvis: No metastases
- US: thyroid nodule tiny
- Mammogram: reported OK
CASE 1: WHAT IS D/D

- Dehydration
- Malignancy: ?GI, ?Other
- Sarcoidosis
- Endocrine causes
- Vitamin D intoxication
CASE 1: CONSULTS

- Endocrine
- Nephrology
- Oncology
- Pulmonary
CASE 1: CLINICAL COURSE

- Calcium normalized
- Not much improvement in clinical condition'
- Not strong for GI work up or bone scan
- Empirical steroids started
- No diagnosis, empirical treatment, unclear natural history, unclear next steps
- Likelihood of yet another hospitalization for the same problem: High
SHERLOCK PRINCIPLES APPLICABLE TO THIS CASE

"It is a capital mistake to theorize before one has data. Insensibly one begins to twist facts to suit theories, instead of theories to suit facts."
"How dangerous it is to reason from insufficient data."

"Data, Data, Data! I can't make bricks without clay."

"I am glad of all the details ... whether they seem to you to be relevant or not."

"It is of the highest importance in the art of detection to be able to recognize out of a number of facts which are incidental and which are vital."
Need adequate data to reach conclusions.

However, too much data is confusing (ordering tests for all possible causes of hypercalcemia rather than deducing a most likely diagnosis and then seeking confirmation).

Challenge is to use the data wisely and reason through it completely till conclusion.
AUDIENCE INPUT ON CASE 1

- Were Sherlock principles followed or not followed in this case?
- Is failure to reach a diagnosis a surprise

- What would Sherlock do in this case?
Both crime cases and medical cases can represent many contradictions.

Sherlock contradicts himself many times, however, his long explanations to Dr. Watson eventually makes some sense of his contradictions.

Similarly, despite initial contradictions, complex clinical situations may run its course eventually rendering itself to a clearer explanation (let natural history or clinical course guide you.)
“I can see nothing," said Dr. Watson.

"On the contrary, Watson, you can see everything. You fail, however, to reason from what you see. You are too timid in drawing your inferences."
CASE 2: I CAN SEE NOTHING

- Describe pancreatic cancer patient with left shoulder pain
- Cardiac cause—rule out, pulmonary cause ruled out, metastases rule out, minimal arthritis, What else?
- Final diagnosis: Left arm arterial blood clot
SHERLOCK QUOTES APPLICABLE TO NEXT CASE

• "I never guess. It is a shocking habit”
• Hypotheses, theories, and guesses are not part of effective problem solving.
• They are useful in deciding on possible solutions, but only after the cause has been identified.
CASE 3 - DETECTIVE WORK: I NEVER GUESS

- Describe prostate cancer patient with lung mass
- Advised change from hormonal therapy to chemotherapy for lung mets
- Biopsy diagnosis: Aspegilloma
"Always approach a case with an absolutely blank mind. Form no theories, just simply observe and draw inferences from your observations."

Presuming a single diagnosis without any basis clouds your judgment and may prevent you from considering the real diagnosis.
CASE 4: ALWAYS APPROACH A CASE WITH AN ABSOLUTELY BLANK MIND.

- Describe a case – patient with new onset seizures
- MRI suggestive a necrotic mass
- Oncology consult for glioblastoma
- Diagnosis: Brain abscess
- Missed or did not pay attention to history of dental work few weeks prior to presentation
TAKE HOME MESSAGE

- If you fail to consider a proper diagnosis you will never make it
- And if you limit the range of possible diagnoses you have no chance of finding the right diagnosis
- If you are very lucky: rarely a diagnosis may become obvious during unrelated or screening tests, even if you are not looking (Buy a big lottery ticket that day! You are in luck!)
"The world is full of obvious things which nobody by any chance ever observes."
NEXT COMPLICATED CASE

- Describe a recent patient with severe CHF and coronary artery disease – unexplained weight loss – presented few weeks ago by one of the residents.
- Extensive work up
- No cancer, No endocrine cause, No pulmonary cause, No liver disease.
- Cardiac cachexia patient
- Repeated admissions
SHERLOCK PRINCIPLES APPLICABLE TO THIS CASE

• "Once you eliminate the impossible, whatever remains, no matter how improbable, must be the truth."
• ‘If you’ve eliminated all other possibilities whatever remains must be the truth’
• The truth must lie within the set of the possible, which is defined as everything that is not impossible.
DETECTIVE WORK: WHAT IS IMPOSSIBLE IN CLINICAL MEDICINE

- No diagnosis would be Impossible, however, contrary to common practice of including them in D/D, exotic rare diseases are Improbable (rare) cause of common symptoms
- Cancer: No symptoms could be impossible from cancer (cancer can possibly cause any of presenting symptom)
- Cancer included in D/D of many symptoms
**LEARNING POINT**

- Impossible = something that can not happen
- Improbable – Something that can happen but probability might be very low
LEARNING POINT

- Also a good strategy for an exam question
- Reach a right answer (even if you are not sure) by eliminating the ones which are certainly to be false
Sherlock used multiple techniques to solve any given crime

Similar, a given clinical situation may require multiple strategic observations to find a solution

So it is important to learn as many strategies as possible
MORE OF HOLMESIAN DEDUCTION – APPLICABLE TO CLINICAL MEDICINE

- Don’t just see, observe the details
- Learn to pay attention to the basics
  + Solution to any problem is “elementary” –
  + Elementary means not simple but rather to understands elements essential of a situation or case
- When talking to some one – be actively passive
  + (No smart phones while taking history)
MORE OF HOLMESIAN DEDUCTION – APPLICABLE TO CLINICAL MEDICINE

- Use all of the senses
  - Anaerobic smell of advanced cancers – many cases
  - Skin thickening of mycosis – recent case
- Say it – tell it to others
  - Holmes talk to Dr. Watson about everything
  - Discuss on rounds
- Adapt to a situation – tailor the approach to fit the case
- Find quiet
  - Filter important observations from inconsequential ones
  - Patient with 100 symptoms – what is important and what is not
INTELLECTUAL PLEASURE FROM TIMELY CLINICAL PROBLEM SOLVING

- Describe current lung cancer case and IPMN of pancreas with imbalance and falls and alcohol use
- Decided to get brain MRI
- Detection of a new brain mass
- Balancing sadness of delivering bad news versus pleasure of problem solving
TAKE HOME MESSAGE

- Many of Sherlock’s scientific methods can be used successfully in clinical medicine in selected clinical situations.
- Teaches us to be attentive but modest and effective—not over confident—not paralyzed from over information.
- I have learned a great deal about what I would do differently on next set of similar cases while preparing this presentation.
BEST OF BOTH WORLDS: MODIFIED SHERLOCK SEQUENCE – COMBINED CONVERGENT AND DIVERGENT THINKING

Research
- Observe and gather adequate data
- Formulate D/D based on unbiased data

Deduce
- Order tests based on most likely D/D
- Confirmatory test

Solution
- Verify diagnosis
- Successful Treatment
Current trend towards extensive use of technologically sophisticated diagnostic and screening tests in routine practice and screening

(Just look at the controversies about screening)

Multiple redundant tests

Excessive faith in technology

Predefined diagnostic and treatment algorithms and guidelines

Screening does not require any research or need for observations to reach a solution
ANTI SHERLOCK TRENDS IN MEDICINE

- Is this a serious threat to the science and art of clinical skills?
- Can we afford an expensive diagnostic work up for exhaustive list of D/D instead of using careful diagnostic reasoning based testing?
- Will doctors risk losing the intellectual pleasure that comes from careful diagnostic reasoning?
DID YOU ENJOY INTERACTIVE FEATURES OF TODAY’S PRESENTATION?

1. Yes: I would like more
2. No: no more
3. Not sure

92%
5%
3%
ARE YOU LIKELY TO USE SHERLOCK PRINCIPLES IN CLINICAL MEDICINE?

1. Yes
2. No
3. Not sure
ANY INTEREST “WHAT WOULD HARRY POTTER DO”?
THEMED PRESENTATION?

1. Ya sure love to
2. No way
3. Not sure— who is Harry Potter
Thanks