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Clinical Case Study Strengthens Clinical Acumen

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Editorial

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Abbreviations: POCT: Point of Care Tests; DMP: Decision Making Process; ACC: Anterior Cingulated Cortex; MTL: Medial Temporal Lobe; ML: Machine Learning; AI: Artificial Intelligence.

Editorial

Traditionally almost all medical journals publish 2 to 3 case studies/case reports which are mentioned at the bottom of the list of index and printed on the last pages. Some journals may not include a case report at times. This scenario implicitly indicates less value of case reports. Reason behind may be because all of us weigh & read research/review articles more than that of case reports. Because everybody thinks research/review articles outweighs case study/case reports. Indeed, Research/review articles are foundation of theoretical/semantic knowledge without which medical science is difficult to comprehend. But practical application of medical knowledge is not only science; many would not argue that is an art as well.

Let's rename that word "art' as 'skill'. Foundation of any skill is wisdom. It becomes skill when applied. Wisdom when applied in clinical set up is recognized as 'clinical acumen'. Clinical acumen is a skill applied to form a judgment & take a correct decision accordingly, Cambridge English dictionary defines. This decision making skill of a clinician which is also referred as 'instinct' has become more difficult to be cultivated due to advances in biomedical engineering, computerized algorithm and that is why some researchers feel it's ability of a few select group [1]. Biomedical engineering has with the help of microfluidics brought point of care tests (POCT) to influence diagnostic field to such an extent that patients can arrive at a diagnosis at their home without a clinician. In other conditions patient may visit doctor with his/her diagnosis and ask clinician to intervene accordingly. Such intervention though evidence/research based may not be beneficial to every patient [2]. This is because, selection of best 'patient pertinent' treatment journeys through 3 factors, (i) clinical state & circumstances, (ii) patient's preferences & actions, (iii) research evidence/test results [2]. So research based or evidence based medical practice is not superior to clinician's judgment. Many physicians opt to rely on their clinical judgment to override results of computerized algorithm [3]. In fact evidence based practice is an adjunct to clinical acumen, R.B. Haynes et al mentions in BMJ Evidence based medicine 2002 [2,3]. Having considered these factors thoroughly it is appropriate for clinician to decide best treatment option on the basis of clinical expertise & clinical acumen under the consideration of research evidence. It is called diagnosis decision making process (DMP) [4].

Diagnosis Decision Making Process (DPM)

When any physician starts examining a patient, he/she starts 'thinking'. Objective of this thinking is to evaluate many aspects of patients/case (Now onward let's say case). Evaluate to arrive at a diagnosis. Making of a diagnosis is the primary but complex focus [5]. Driven by this focus two types of thinking takes place in the mind of physician, (1) Autonomous; which is automatic, fast, reflexive, may be erroneous & (2) analytical; which is slow, deliberate, rule and evidence based. Autonomous thinking is also called 'intuitive thinking. Intuitive thinking is based on innate (disposition by birth) & associative learning. Associative learning takes place implicitly & explicitly during education [6]. This type of thinking is also called 'dual thinking processes'. Approach

of this dual thinking process is (i) forming a hypothesis of possible diagnosis & to deduce it to final diagnosis (which is called Hypothetico-deductive approach), & (ii) pattern recognition (where pattern of presentation of patient's illness is recognized implicitly). When applied this hypothetico-deductive method of physicians generates opinion, verify this opinion, and determine this opinion to a final diagnosis.

However, even after deep analytical thinking an astute, experienced physician may not gather courage to decide to act on this finally, analytically arrived diagnosis. This is because his/her autonomous diagnosis probably has not yet been justified if correct or to be evaluated if incorrect. When analytically built diagnosis gets linked appropriately with autonomous diagnosis, treatment action plan may proceed smoothly. To this **'link'** we refer as ***"clinical acumen"***.

How to Build Clinical Acumen

Foundation of this acumen is 'critical thinking' which is processed through 'cognitive thinking'. This means clinical acumen is product of amalgam of critical thinking with cognitive thinking. Cognition is a wisdom of a person which compels him/her to deliberate the decision making process to pass through various 'skills', e.g. clinical reasoning skill, deliberating one's own biases and impulses, skill to test clinical hypothesis, awareness about one's own thinking like a critic, ability to see in near future regarding patient's response to treatment/intervention/ side effects etc. This mental ability obviously need sound semantic information, clinical expertise, and vivid episodic memory. Kimberley Lee et al too think 'ability to test clinical hypotheses' is heart of diagnostic acumen [7].

Case Study-An Episodic Memory

Caser report is a description to create vivid picture of a patient & his/her correlates. It's like an event to be virtually & reflexively experienced by a reader. In this case readers are physicians/medial students. They might not get involved emotionally while reading a case study. However, analytical, cognitive & reflexive thinking of a physician gets involved. Hence any case study could be virtual, reflexive, indirect self experience for a physician. Such relational self-experience or encounter with any event is stored in "episodic memory". So such meaningful, picturesque context of case report belongs to episodic memory. Episodic memory is about what, where, & when episode has occurred (Clayton & Dickinson 1998). It's type of long term declarative memory. It's linked with neuroscience of cognitive memory. Hence it can be critically applied in problem solving [8]. On the similar note Tuvling says its neuro-cognitive entity. He says episodic memory is the only type of memory where past can be re-experienced (Endel Tuvling 2002). Episodic memory comprises of sense of subjective time, autonoetic awareness & self [6]. Autonoetic awareness help person remember past. Retention of such events & its meaningful context takes place in PFC. Memory in PFC remains retrievable for a long time. Link between PFC & Hippocampus helps storing of new memories, attaching them with old schemas. This link between Hippocampus & PFC attributes not only permanent storage of episodic memory but retrieval of episodic memory too at the stimulus of retrieval cues.

Advantages of Reading Case Study

Case study stimulates positive mind-set of physician because it's like reading a story. It stimulates reflexive learning. It provokes sharing attitude. Physicians draw inspiration from case study & that is why some of the novel case study reports are remembered over the decades. It encourages physicians to think analytically, critically on the ground of sound clinical expertise. It teaches fellow physicians to belief firmly on self while going through decision making process (DMP). By its virtue deeper level of learning gets stimulated among physicians [9]. It stimulates behavioral learning among fellow-physicians. Many case studies implicitly re-emphasize presence of clinical acumen & communication skills of a physician who has written it. It creates subtle change in hypothetic-deductive approach of a reader.

Case study is more effective than classroom discussion & text book learning. Kevin M Bonney advocates it over lecture method of learning [10]. It stimulates problem based learning. It facilitates inter-disciplinary learning & cab be used while solving real life problems. It is gaining popularity during recent years in the fields like biology, chemistry, nursing & psychology over and above the medical science. It's worth reminder that case study teaching has been useful in non-clinical subjects like anatomy, physiology, etc. [10].

Neural Connections of Case Study and Episodic Memory

Neocortex, PFC, Amygdale, Anterior cingulated cortex (ACC), medial temporal lobe (MTL), hippocampus, is the brain regions related to episodic memory. MTL is occupied by event memory. Neural structures involved in retrieval of episodic memory are temporal, frontal,

parietal cortices, with diencephalon & cerebellum. Retrieval structures are not static; they depend on practice, experience, & genetic disposition (L. Nyberg 2008).

Hippocampal-Prefrontal Pathway

While reading case reports & its meaningful context PFC gets engaged. Simultaneously Initial neural representation of new experience gets framed. During this time of reading; PFC interacts with hippocampus to frame new experience & later assimilate these new memories which then get attached with old 'schemas' to become part of long term memory (Current Biology 2013) [11]. Neuron extending from CA 1 region of hippocampus & from Subiculum to prefrontal cortex is responsible for retrieval pathway of episodic memory. Hippocampal processing supports retrieval of details of memory. Interaction through H-PFC pathway is involved in cognition related to executive function, i.e. what action to be taken while deciding diagnosis. This pathway executes emotional regulation as well; to facilitate readers to refrain emotional involvement [12].

Discussion & Suggestions

So it seems that clinical acumen is indispensible, integrated soft skill to be used in medical practice but not as a solitary tool. Because it is observed by many of us that only high semantic knowledge does not build a high clinical acumen. It is also observed that only high clinical acumen is not adequate to arrive at a correct diagnosis, especially for GI symptoms [13]. Collaboration of clinical expertise based on sound semantic knowledge & clinical acumen based on episodic memory based knowledge is essential to decide appropriate medical intervention. Semantic knowledge can be increased by reading text. But what is needed to increase clinical acumen then? Our submission is study of case reports enhance episodic memory based clinical acumen which would be answer.

Author's Views/Suggestions

1. Case reports or case studies published in medical journals occupy a small space, may be 10 to 20%. Criterions of selection of cases to be reported have always been 'rare case'. Rare case is a deterring title enough to de-motivate a busy clinician. This criterion needs to be amended. Instead of rare case criterion, it should be 'interesting case', case with 'unique features' e.g. unique course of illness (may not be unique illness only), unique relevant information about patient, attributing factors, previous treatment, presentation of illness, difficult differential diagnosis, etc.
2. Case publication should be made compulsory to all interns. Interns may submit case report manuscripts to their college; get guidance before sending it to publisher. This compulsion is a need of present time because patients now a day demand doctors to have better communication skills. Written & verbal communication skills will develop because of this compulsion. On the similar note, Dr. Melnick says that communications kill is indispensible in medical field. On the similar note, Columbia University College of physicians & surgeons in New York City has already started movement to ask their medical students to write 'reflectively' from the literature [14]. We are suggesting here to ask interns & doctors to write reflectively & publish. Even single case study can contribute to cognitive neuroscience theories or hypothesis [8].
3. Machine learning (ML) and Artificial intelligence (AI) are two rapidly progressing technologies that have already begun to make an impact in the clinical setting. Image analysis is a critical step that follows any kind of imaging of the human body or a biological sample. Be it a brain scan or a biopsy slide image, analysis must follow and it can be manually done by a medical specialist or a pathologist, or instead it can be done by a computer. Artificial intelligence is the tool that can make a computer program smart enough to apply clinical knowledge and historical observations to a piece of data in order to dig out any possible information that can aid diagnosis. Many models of AI are already being used by dermatologists, radiologists and pathologists for image analysis; this has added to their accuracy and increasing speed of diagnosis [15]. Machine learning for clinical psychology and psychiatry exploits statistical functions from multidimensional data sets to make generalizable predictions about individuals [16]. Neuroimaging analysis in psychiatry is also a potential recipient of the benefits of AI and ML [17,18]. Predictive models written with the help of ML can not only help diagnosis, but can also help uncover cognitive mechanisms and ask new questions [19].

The opportunity of bringing this technology is associated with challenges such as data availability and management, reproducibility and more [20]. Along with the adaptability challenges, the technological intervention itself is a threat to clinical acumen acquired and practiced widely by the medical specialists [21]. The bigger question posed by advent of big data and computational tools is will the faster and automated diagnosis result in replacement of clinical manual diagnosis [22].

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