American Chemical Society AMA: I'm Mike Lee, President of Milestone Development Services & founder of Mozaic Solutions, here to discuss personalized healthcare and the unique role of analytics. AMA!

AmerChemSocietyAMA [1] and r/Science AMAs[1]

[1]Affiliation not available

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Abstract

I am Mike Lee, President of Milestone Development Services and founder of Mozaic Solutions. I am here to discuss personalized healthcare and the unique role of analytics - new technologies, methods, workflows, and regulations. Advances in analytical technology combined with our desire to live longer has generated significant excitement and opportunities in the sciences. Measurement - sensitive and fast - will be a hallmark of healthcare solutions providing early detection of disease and treatments that can be tailored to specific sub-groups (personalized healthcare). An intellectual perspective will likely focus on scientific merits of the analytical measurement and/or a specific disease. The reality is that advances in personalized healthcare will likely be led by our competitive nature via performance monitoring (i.e., athletics, competitive sport, daily testing, hourly testing) to identify a molecular signature of high performance. Once identified, such a high performing condition becomes an "asset." Measurement then naturally focus on the protection of this so-called asset. Thus, a comprehensive series of measurements to will be required to ensure high performance via diagnostics markers to prevent injury and/or disease. The reality is that the fundamental analytics required for personalized healthcare are available today. These analytics will require significant integration and miniaturization along with informatics to assist with data process and visualization. Leadership via high performing athletes, for example, will likely provide education to the general public and generate an active interest and broad-based participation on an individual level - personalized healthcare. I'll be back to answer questions at 12:00pm ET (9 am PT, 4 pm UTC). Feel free to ask me anything about emerging analytical technology, real-time analytics for personalized healthcare, and trends within the pharmaceutical industry. Edit 12:00 PM EST - I'm on line! Thanks to everyone for your questions! Thank you for participating in the AMA! As a thank you we'd like to extend a discount to you for my course Analysis and Interpretation of Mass Spectral Data offered through the American Chemical Society. Register between now and October 22, 2015 using the code ACSREDDIT20OFF to receive 20% off of your registration fee.

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AMERCHEMSOCIETYAMA R/SCIENCE

ABSTRACT

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READ REVIEWS

WRITE A REVIEW

CORRESPONDENCE:

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September 23, 2015

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What kind of analytics are we talking here, proteomics, metabolomics...? Are you looking for biomarkers for performance limits, diseases and such? And what kind of personalized medicine are you building on the personal analytics you propose?

ABoutDeSouffle

Yes, the analytics that I am referencing here with regard to personalized medicine is mainly from my experiences with proteomics and metabolomics. Essentially, providing the patient a "snap shot" of their health condition via an ensemble molecular markers (biomarkers) on a monthly, weekly, daily and/or hourly basis. The markers seem to fall into two categories for health/performance - early identification of a disease or health issue (analytics requiring a molecular microscope of sorts); and then followed by

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vigilant monitoring to determine if course of action (i.e., therapy, drug) is working or if dosing is correct or side-effects (analytics requiring a molecular plate reader, for example). My sense is that the notion of personal analytics will likely come into prominence due to competitive factors - those who are most interested in their well being will likely be the most interested in the information as well as most vigilant. As these folks share their findings and their enthusiasm for data and knowledge, interest may be sparked with others with similar interests or issues. Perhaps following a path similar to as the early users of computers or cell phones - where there did not appear to be an immediate need for the consumer (non professional); but now these tools/technologies are essential in order to compete. ML

Wow, so these analytics could help create more widespread use of personalized healthcare? That's incredible. What pharmaceutical trends among the top athletes are going to wind up reaching the laymen in the next decade?

Boughner

Yes, the analytics that I am referencing here with regard to personalized medicine is mainly from my experiences with proteomics and metabolomics. Essentially, providing the patient a "snap shot" of their health condition via an ensemble molecular markers (biomarkers) on a monthly, weekly, daily and/or hourly basis. The markers seem to fall into two categories for health/performance - early identification of a disease or health issue (analytics requiring a molecular microscope of sorts); and then followed by vigilant monitoring to determine if course of action (i.e., therapy, drug) is working or if dosing is correct or side-effects (analytics requiring a molecular plate reader, for example). My sense is that the notion of personal analytics will likely come into prominence due to competitive factors - those who are most interested in their well being will likely be the most interested in the information as well as most vigilant. As these folks share their findings and their enthusiasm for data and knowledge, interest may be sparked with others with similar interests or issues. Perhaps following a path similar to as the early users of computers or cell phones - where there did not appear to be an immediate need for the consumer (non professional); but now these tools/technologies are essential in order to compete. ML

Indeed. My sense and initial experiences - combined from both the pharmaceutical industry and the analytical community - is that the analytics of "selection" and "asset management" are nearly identical! The pharmaceutical industry must select the best lead compounds via testing and measurement and follow a path from test tube to the clinic. Ultimately, if fortunate, the compound can be approved (efficacy, safety) to be marketed to the public for a specific disease where the entity becomes an asset. Competitive sports teams will likely do the same via a similar testing - molecular signatures/molecular microscopes - and likely find a consistent trend and/or pattern (i.e., proteins, biomarkers) for desirable traits and/or performance attribute(s) for selection onto their team. Once proven to be a valuable contributor - realizing that the process/analytics is similar to the pharmaceutical industry selection of drug candidates - the athlete becomes an asset (akin to when a drug candidate becomes an FDA approved marketed product). And thus, analytics will focus less on selection but rather the protection of the asset via the monitoring the markers of stress, fatigue to prevent injury, or perhaps, markers for strength to determine if rehabilitation is successful. So, widespread use may likely follow a path via built in vigilance for health - athletes - who require performance monitoring from diet to analytics such as proposed here (ensemble of markers indicative of a specific goal or condition). A similar need for analytics is demonstrated today with the use of daily monitoring systems such as a FitBit, for example. Where heart rate, steps, distance traveled, calories, etc. are monitored to give a sense of health to be correlated to how we actually feel. A "molecular FitBit" where markers (i.e., proteins) can be analyzed on a routine level to determine optimum levels for performance and / or diet can be realized in daily or even hourly interval(s) or as needed. Once such a process is benchmarked it becomes easier to envision such a process (monitoring molecular signatures of health on an individual basis) spreading and becoming adopted within the a group beyond a competitive athlete. Similar analytical technologies and informatics that are used within the pharmaceutical industry are likely to be adopted - only they need to be capable of operating at a significantly higher level of throughput. ML

1.When you say Mozaic Solutions is transforming health care through use of segmented flow, what is Segmented flow?

2 And a follow up would be, can other clinics and hospitals realistically adapt this or is it strenuous/expensive to start up?

Mr_Miyagii
Mozaic Solutions (see http://mozaicsolutions.com) represents a strategic partnership between the University of Michigan (see http://kennedygroup.lsa.umich.edu) and a leading biotechnology company, New Objective (http://www.newobjective.com/index.shtml) located in Woburn, MA. Segmented flow is a specific technology that addresses a specific need to allow for personalized healthcare and corresponding analytics - the need to provide rapid analysis of markers indicative of health (i.e., molecular signatures). Specifically, segmented flow technology, literally to connects the analog world of a high performance liquid chromatograph with the digital world of the mass spectrometer. The combination of liquid chromatography with mass spectrometry (lc/ms) is a powerful analytical technique used widely throughout the pharmaceutical industry to follow/monitor the disposition of a drug - from test tube to the clinic. Perhaps the only weakness of lc/ms is the long cycle times (minutes) that provide a barrier for this research grade analytical platform to be effectively and realistically applicable to personalized healthcare needs (i.e., daily performance monitoring). The issue (or opportunity) is likely to focus on the lc component of such a platform - which is inherently analog. Briefly, segmented flow technology allows for the digitization of the fluid stream - creating discrete droplets - effectively digitizing the lc. The result are cycle times on the order of Hz rather than minutes. More information and background on segmented flow technology as well as lc/ms can be found at Mozaic Solutions as well as New Objective - founded by Gary Valaskovic and Emily Ehrenfeld - and the laboratories of Professor Robert Kennedy at the University of MIchigan. ML

Are these measurement tools internal or external to the body and what is the user interface like?

whatwoulddildodo
The measurement tools that I am specifically referencing (but not limited to) would require a sample specimen (i.e., urine) obtained from the patient. However, the specimen(s) would be highly dependent on the specific marker to be measured. So, the workflow would look something like this: 1) patient provides a urine sample (at home or at clinical site with an appropriate container); 2) patient drops off the sample on site; 3) patient obtains results (<1hr or less) whereby data is sent to a secure location or destination or site as would banking information, for example. This specific example could be applicable to many analytical platforms - beyond lc/ms - and of course, include a host of samples such as saliva, hair, blood depending on the site and/or marker compound(s) of interest. Non-lc/ms assays may even be conducted in the home. ML

Greetings! How might someone go about entering this field? Is a PhD/MD in a particular field required, or are there other avenues of entry?

geetarzrkool
A great question as this is a relatively new and/or emerging field. I am not sure that such a market has defined itself as of yet. Certainly, the starter of such a field will have its origins in health related industries such as the pharmaceutical industry (i.e., research, measurement, regulatory compliance), technology/service providers (i.e., tools for analysis and measurement), and of course, current clinical laboratories that service patient needs. As envisioned in my earlier response/post - there will also likely be new initiatives resulting to such a need whether with an existing entity (i.e., university, professional sports team, pharmaceutical company, drug store chain) or a new endeavor such as a start up. ML

What role can independent contracting/entrepreneurship have in adopting these more efficient medical technologies? Specifically from a software and web perspective

kevincredible

Independent contracting and entrepreneurship will have a significant role for the development and adoption of more efficient medical technologies. These roles would likely range from technology providers (i.e., technology, methods, workflows, regulations, software) to service providers dedicated to the support of such endeavors. However, software will also likely be a highly enabling and differentiating attribute. Not that it will be trivial to provide analytical data at unprecedented levels. But the ability to capture the immense amounts of data, process and interpret, in a highly secure manner - will be essential - and perhaps, may be the key differentiator of future analytical platforms to be used by patients (i.e., beyond research). Certainly, universities as well as existing technology providers will have early opportunities for participation in this field via proteomics/metabolomics initiatives, innovative technologies and the experience of harmonizing technology with regulations. Even newer approaches that are web-enabled to provide data, information as well as feedback and appropriate referrals/references in a highly secure manner are likely to dominate once the approach/technology/servce is better understood and adopted. ML