

Medical Imaging in Novel Drug Development

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Submission: April 17, 2015; Published: April 25, 2016

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Abstract

Medical Imaging is now being used extensively, in fact more than ever, for clinical trials for a new drug development. Medical imaging can be used through any of the available imaging modalities, including quantitative imaging with the help of CT, MRI or hybrid PET-CT. Much time and money can be saved in not proceeding with a clinical trial as imaging can predict fairly well and early about the efficacy of a compound for the disease process in its evaluation as a “Go-No Go” approach.

FDA and other regulatory authorities also believe that medical imaging is a critical component in its Critical Path Opportunity List of 2006.

It is significant to note that pharmaceutical companies and CROs employ imaging as its important tool to quantify matrix for its justification of introducing a new drug, but standardization in terms of patient positioning or the central reads have to be justified against institutional reads.

Keywords: Medical imaging; Quantitative imaging; Imaging modalities; Central reads; FDA; Clinical trials; Drug development; Imaging review charter

Abbreviations: CT: Computed Tomography; MRI: Magnetic Resonance Imaging; PET-CT: Positron Emission Tomography- Computed Tomography; dGEMRIC: Delayed gadolinium enhanced Magnetic Resonance Imaging; fMRI: Functional Magnetic Resonance Imaging

Introduction

Medical Imaging has come a long way from just being simple X-Rays to now 3D or 4D imaging in multi-planar imaging in its short period of use in clinical trials. It now uses complex MRI imaging protocols dGEMRIC, elastography or Quantitative CT (Q-CT), and fMRI. This list of imaging can be extensive but it is imperative to note that X-Rays are still used for some clinical trials, especially for arthritis.

It is just not drug efficacy or drug safety that can be monitored with medical imaging but also pharmacokinetics and pharmacodynamics in imaging endpoints. Imaging biomarkers can be a better indicator of disease progression or disease free survival than the clinical end results as these are faster indicators, even when studied as surrogate endpoints [1-3]. Any imaging modality will provide information about dosing, safety or pharmacokinetics [4].

Imaging Review Charter

Imaging review charter is a fundamental document for all the stake holders in a clinical trial. It gets its inputs from the sponsor of the study and is prepared with the help of expert

medical imaging guidance for the intended audience that may be technologists or radiologists in an imaging core lab, sponsors and the regulatory authorities. FDA mandates the use of imaging review charters [5]. This Imaging charter is submitted to FDA or other regulatory approval bodies to make sure that a clinical trial is executed within regulatory norms.

Blinded Independent Central Imaging Reads

The importance of central reads over local reads has been debated over and over by various researchers. Central imaging reads certainly has its advantages: intensive training, more robust platforms and software, better tumor delineation and measurements and less discordance. The bias associated with central reads of informative sharing still exists, though. United States Food and Drug Administration Oncologic Drug Advisory Committee have discussed the discordance issues between local evaluation site reads and independent central imaging [6].

Clinical Trials Governance In Imaging

Good clinical practice and Good clinical research practice forms the basics of clinical trials governance. In the midst of getting the project out, these are the two sets of principals that

regulatory authorities are looking at. The main aim of these standards is to make sure that the researchers are adhering to certain quality parameters for the ultimate performance of the clinical trial.

Role of Imaging In Drug Pharmacokinetics And Pharmacodynamics

Imaging can provide most useful information in pharmacokinetics and pharmacodynamics of a drug such as PET or hybrid imaging of PET-CT. The distribution of drug can thus be monitored and sensitivity and efficacy can be studied. Decreased FDG uptake can be an indicator of the improved status of a cancer patient [7]. This can also mean the elimination of non-productive clinical drug development that do not show wanted pharmacokinetics of molecular compounds.

Role of Imaging In Drug Safety

Drug safety can be best demonstrated with the use of medical imaging, sometimes even before it shows up by laboratory work. In fact, imaging may be the only indicator of disease progression, when body functional reserves are still not depleted for urine or serum assays. This early indicator of drug safety is very vital for any clinical trial.

Conclusion

Medical imaging is just not vital for an effective execution of a novel drug development program in a clinical trial, but it

is also needed for regulatory approvals. With its non-invasive application, it has shown significance in pharmacokinetics and drug safety mechanism. Use of imaging charters helps to standardize imaging of patients and use of imaging protocol in various phases of clinical trial. With modern imaging modalities, medical imaging is becoming an inevitable part of any clinical trial involving oncology, infectious disease, body, musculoskeletal or any other therapeutic study.

References

1. Shankar LK, Van den Abbeele A, Yap J, Benjamin R, Scheutze S, et al. (2009) Considerations for the use of imaging tools for phase II treatment trials in oncology. *Clin Cancer Res* 15(6): 1891-1897.
2. DeMichele A, Berry DA, Zujewski J, Hunsberger S, Rubinstein L, et al. (2013) Developing safety criteria for introducing new agents into neoadjuvant trials. *Clin Cancer Res* 19(11): 2817-2823.
3. Kongress Medizin und Gesellschaft (2007) Augsburg. 17.-21.09.2007 German Medical Science GMS Publishing House, Düsseldorf, Germany.
4. Wang YX, Yan SX. *Lab Anim* (2008) Nutraceuticals: Efficacy, Safety and Toxicity 42(4):433-441.
5. Guidances (Drugs) All FDA Guidances, U.S. Department of Health and Human Services, U.S. Food and Drug Administration, USA.
6. Sunil A, Raghavendra RM, Gaurang P, Sanju A J, David A, et al. (2016) Blinded Independent Central Imaging in Clinical Trials: Does it ensure Against Bias? *Canc Therapy & Oncol Int J* 1(1): 555559.
7. Michael D Farwell, Amy S Clark, David A Mankoff (2015) How Imaging Biomarkers Can Inform Clinical Trials and Clinical Practice in the Era of Targeted Cancer Therapy. *JAMA Oncol* 1(4): 421-422.