2 Biomarker Classification

During the drug development processes, biomarkers are used to determine the success of development milestones. These milestones help with de-risking the drug program as well as de-risking the patient population in which the new drug is to be tested. Biomarkers are used to answer important questions such as "Does this new drug hit the planned target?" "Is this drug safe?" "Is the therapy more effective in one population?" "Does the biomarker predict survival?" "Is this biomarker unique to disease status?" "Does this biomarker guide treatment decisions?" Herein we will describe and answer the aforementioned questions in more detail explaining how biomarkers are used in monitoring the drug development process and clinical responses.

2.1 Does This New Drug Hit the Planned Target?

Prior to and after administering the new drug, biological samples will be collected and used for pharmacodynamic biomarker studies. A pharmacodynamic biomarker shows that a biological response has occurred in a patient who has received a therapeutic intervention, and for which, the magnitude of change of the respective biomarker is linked to the response. Pharmacodynamic biomarkers are largely used for dose finding and often provide decision relevant information that supports the proof of concept (PoC) and/or proof of mechanism (PoM) that is required to be met in order for the drug to continue on through the drug development process. The use of specific pharmacodynamic biomarker in the development of targeted therapies defines important data enabling early go/no-go decisions, selecting combinations of targeted agents, and optimizing schedules of drug combinations. The respective biomarker assays need to provide robust and accurate measurements.

2.2 Is This Drug Safe?

Safety or toxicity biomarkers reflecting a response to treatment are used to detect or monitor adverse effects in a patient receiving a therapeutic intervention. Prior to be administered to humans, several preclinical animal models of different species are used to understand the potential toxicological profile for the new drug. Routine biomarkers such as liver enzymes are measured and are used to determine a suggestive toxicological profile. Urinary kidney injury molecule-1 (KIM-1) is the first biomarker of kidney toxicity qualified by the FDA and EMA and is expected to significantly improve kidney safety monitoring. Traditional biomarkers of renal injury, including serum creatinine (SCr) and blood urea nitrogen (BUN), do not show the sensitivity and/or specificity to adequately detect nephrotoxicity prior to significant loss of renal function. In multiple models of kidney injury, urinary KIM-1 significantly outperformed SCr and BUN (Vaidya et al. 2010). In addition,