Medical cyber-physical systems forming a comprehensive and complex framework comprised of numerous interactions among physical, cybernetic, and human layers of processing and interaction come with a wealth of challenges and opportunities. The central challenge being of paramount relevance concerns a comprehensive linguistic data description and analysis carried out in non-stationary and dynamic environment. The commonly encountered streams of data need to be processed in an efficient manner to assure a seamless interaction with the users (patients, medical personnel, and health care providers and administrators) and the system, assess the quality of data as well as deliver interoperability of various subsystems positioned in the physical and cyber sphere. We demonstrate that the efficient realization of processing is carried out at the level of information granules (non-numeric linguistic entities) and engages the methodology and algorithms of Granular Computing and Computational Intelligence to complete data processing and deliver accuracy and interpretability of the results. The non-stationary and dynamic environment predominantly manifesting in data streams, implies two categories of problems, namely (i) a dynamic formation of information granules coping among others with concept drift, and (ii) analysis of data in the context of so-called referential information granules that are posed and solved in the realm of Granular Computing. A series of design guidelines supported by intensive experimental studies (built upon the intensive expertise of the Institute of Medical Technology and Equipment ITAM) will be developed to facilitate direct applicability of the established framework and support well-rounded design practices exercised in the development of medical cyber-physical systems.