Clinically established thermal therapies such as thermoablative approaches or adjuvant hyperthermia treatment rely on accurate thermal dose information for the evaluation and adaptation of the thermal therapy. Intratumoural temperature measurements have been correlated successfully with clinical end points. Magnetic resonance imaging is the most suitable technique for non-invasive thermometry avoiding complications related to invasive temperature measurements. Since the advent of MR thermometry two decades ago, numerous MR thermometry techniques have been developed, continuously increasing accuracy and robustness for in vivo applications. While this progress was primarily focused on relative temperature mapping, current and future efforts will likely close the gap towards quantitative temperature readings. These efforts are essential to benchmark thermal therapy efficiency, to understand temperature-related biophysical and physiological processes and to use these insights to set new landmarks for diagnostic and therapeutic applications. With that in mind, this review summarises and discusses advances in MR thermometry, providing practical considerations, pitfalls and technical obstacles constraining temperature measurement accuracy, spatial and temporal resolution in vivo. Established approaches and current trends in thermal therapy hardware are surveyed with respect to potential benefits for MR thermometry [1)].

1)
Winter L, Oberacker E, Paul K, Ji Y, Oezerdem C, Ghadjar P, Thieme A, Budach V, Wust P, Niendorf T. Magnetic resonance thermometry: Methodology, pitfalls and practical solutions. Int J Hyperthermia. 2016;32(1):63-75. doi: 10.3109/02656736.2015.1108462. Epub 2015 Dec 27. PubMed PMID: 26708630.