CCT TG Body Temperature Measurement
Graham Machin, Xiaofeng Lu, Maria-Jose Martin, Igor Pusnik, Wang Li, Dolores del Campo

CCT WG NCTherm, TG BTM 20 October 2020
CCT TG Body Temperature Measurement

- The CCT President, and CCT Strategy WG, established a Task Group for body temperature measurement (TG BTM)
- TG under CCT WG for Non-Contact Thermometry
- The initial focus will be to improve non-contact body temperature measurement (ear, forehead, thermal imaging)

Purpose
- The task groups purpose is to establish reliable clinical thermometry on a global basis
New CCT task group on body temperature measurement

- Its objectives are:
  
  Lead a key comparison of calibrators for body temperature thermometers (ear/forehead/thermal imagers) – (Xiaofeng Lu, NIM, China)

  Collect and consolidate current best practice/standards of body temperature scanning in a) health services b) airport and other screening around the world (Igor Pusnik, UL, Slovenia)

  Collect current best practice of body temperature measurement and develop a definitive summary of the main body temperature measurement approaches (Maria-Jose Martin, CEM, Spain)

  Review standards and work with appropriate standardisation bodies (e.g. ISO/IEC) concerned with producing standards for body temperature measurement devices – (Wang Li, NMC A*Star, Singapore)

  The TG, in collaboration with the RMOs, will establish a forum of users and suppliers/manufacturers of body temperature measurement devices to identify the problems and develop practical solutions and establish appropriate links to the World Health Organisation – (Dolores del Campo, Euramet TCT Chair)
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- Actions to date:
- Agree groups initial terms of reference (12 June 2020)
- Hold inaugural meeting (7 July 2020)
- Establish four+one sub-Task Groups
- Progress review meeting with sub-TG chairs (18 Sep 2020)
- Report to CCT on progress (October 2020)
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- **External engagement:**

  Invited keynote to APMP webinar “Challenges of use of IR in public health” July 2020


  Gave invited talk about the TG to UK Medicines and Healthcare products Regulatory Agency (MHRA) Sep 2020


  Questionnaire circulated to all RMO TCTs about current practice re body temperature measurement
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- Reports from sub-TG leaders
**Key Comparison of BTM**

**Scope:** Comparison of radiance temperature scales for clinical infrared ear thermometers and forehead thermometer (35°C – 42°C)

**Comparison Chain:** STAR + Round-Robin

**RMO Co-Pilot lab:** EURAMET, SIM, APMP, COOMET…

**Transfer artifact:** Ear and forehead thermometer blackbodies

**Participant:** Participant NMIs measure the radiance temperature of the transfer blackbodies using their own infrared clinical thermometers with high resolution and good repeatability

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**Measurement period of plan**

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Participant NMIs

NIM
NMISA
KRISS
NRC
CENAM
INMETRO

NMIA
A*STAR

PTB
CEM
TUBITAK
VNIIM

LNE-Cnam
INRiM
QCC-EMI
NSC
Sub-TG: Collect current best practice of body temperature measurement and develop a definitive summary of the main body temperature measurement approaches, including pros, cons

Sub-TG Tasks:

• Collect all the standards, best practice guides, regulations, health recommendations, documents and procedures → done, main documents collected

• Develop a practical guidance for ear and forehead radiation thermometers (IRET and IRFT): conditions of use and the uncertainties associated with them. The aim is to give to the interested community a comparative study (metrological/uncertainties) of the different equipment for measuring body temperature. → in progress

• Develop some simple presentations that could be used for training in use. It could be focused to not metrologist users.
Sub-TG: Collect current best practice of body temperature measurement and develop a definitive summary of the main body temperature measurement approaches, including pros, cons.

Two drafted documents:

- Best practice guide: use of ear radiation (or forehead) thermometers to perform traceable non-contact measurements of human body temperature → 2nd draft circulating until the end of October in the sub-TG. Circulation in the whole TG in November.

The uncertainty in use the most important contribution.
“body temperature scanning” group timetable of activities

• Establishing the group of active members (by the end of September 15 members volunteered)
• Distribution of the draft protocol (prepared by Igor Pušnik, sent to active members for discussion)
• Gathering the protocols for entry points in countries and healthcare units (by the end of November)
• Analysis of the protocol (by the end of 2020)
• Final version of the protocol and report to the CCT (by April 2021)
• Proposal of further research relevant for support of scanning protocols (by April 2021)
Discussion and objectives

• In the light of recent pandemic it seems that technologies for non-contact body temperature measurement, although relatively simple and easy to use from users perspective, represent a great challenge also to temperature experts which have to provide:
  • metrological traceability of measuring instruments
  • and relevant guidance how to use various instruments in order to provide accurate, reliable and traceable results.
SUB-TG: LIAISON WITH STANDARDIZATION BODIES CONCERNED WITH PRODUCING STANDARDS FOR BODY TEMPERATURE MEASUREMENT DEVICES

Wang Li
Principal Metrologist
National Metrology Centre / Mechanical Metrology Cluster / Temperature and humidity laboratory

18 Sep 2020
Works done

- Studied the current standard ISO 80601-2-56:2017 on clinical thermometers:
- Gaps have been analyzed preliminarily
  - There is no differentiation between ear thermometer and forehead thermometer
  - There is no standard on the correlation between the forehead skin and the body core temperatures and the correlation is very much established by each manufacturer itself
  - There is no requirement on study of the physiological effects on the forehead skin temperature such as effect from environmental conditions and the defined environmental conditions in the standard are for equipment only
- Successfully joined ISO/IEC WG on clinical thermometer as Singapore representative (ISO/TC 121/SC 3/JWG 8 or IEC-TC 62/SC 62D/JWG 8) and will join the next meeting on 16 Oct 2020
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- Dolores del Campo (CEM) “establish a (RMO) forum of users and suppliers/manufacturers”

First step – engage community through questionnaire

Why?
The Covid-19 crisis (and previous virus outbreaks) has brought into the spotlight how unreliable body temperature measurement can be in health services and more generally around the world. In addition, poor body temperature measurements are suspected of fuelling antibiotic resistance and increasing avoidable deaths and therefore the problem has to be addressed as a matter of urgency. The reasons why this issue has arisen are complex but are thought to have their origins in the replacement of mercury-in-glass clinical thermometers, which were well understood with low uncertainties, by a range of different thermometer modalities and body temperature measurement sites.

Purpose
The purpose of the task group is to establish reliable clinical thermometry on a global basis. Its initial focus will be infra-red approaches, tympanic and skin (e.g. forehead/thermal imaging). One of the main objectives of the group is to collect and consolidate current best practice and standards for body temperature measurement. This information will be used to develop definitive guidance for body temperature measurement, including a statement of likely uncertainties and the advantages and disadvantages of the different methods.


If you are a manufacturer, supplier or user of instrumentation for body temperature measurement, we will appreciate your participation in our stakeholder’s forum and replying to this questionnaire: GO TO QUESTIONNAIRE.
PRELIMINARY RESULTS OF THE SURVEY ABOUT BODY TEMPERATURE MEASUREMENTS

Profile of the respondents by RMO:

Most of the respondents are interested in take part in the stakeholder’s forum:

International standards mentioned by the manufacturers:
- MI 3556-2009
- ISO 17025 / CE / FCC
- CNS, ASTM, EN

Performance of the periodical calibrations:
Next steps to end 2021

Prepare advanced drafts of GPGs ear, forehead, thermal imaging by end of 2020

Elicit comments on GPG from relevant medical community

Prepare one-page GPGs for clinical use, with estimates of uncertainty

Prepare final versions of GPG to encompass all three modalities

Grow engagement with standards committees – TG members please join (WL)

Initiate KC of ear thermometer calibrators