EXERGEN

TemporalScanner™

TAT-5000 Series
Professional Models

New Independent Studies Show Exergen Reduces Hospital Costs by 90% Compared to Other Thermometers

Invented, designed, assembled, tested, and packaged in the U.S.A. by Exergen

- More than 70 published studies supporting accuracy from preemies to geriatrics, in all areas of care.
- TAT-5000S Connected Models available on leading Vital Signs Monitors for EHR data integration.
- Rugged, reliable construction, protected by Lifetime Warranty.

Register for a Chance to Win a Free **Home Model Thermometer**

www.exergen.com/TAT5000-819302

Changing the Way the World Takes Temperature

Exergen TAT-5000S Connected Models are now available on leading Vital Signs Monitors for EHR Data Integration

Philips SureSigns VS4

GE Healthcare VC150, V100, Corometrics

Capsule SmartLinx Vitals Plus

Midmark IQvitals® Zone

ZOE 740Select

Spacelabs Qube®, Xprezzon®, Qube® Mini

Schiller Diagnostic Station DS20

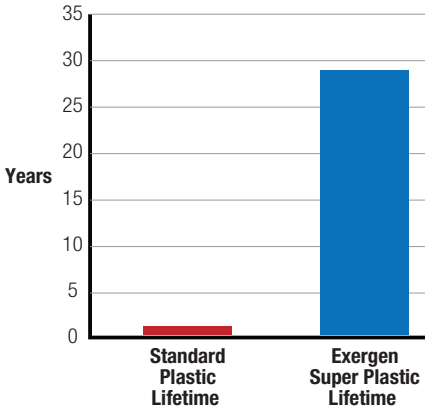
TAT-5000 Series Professional Models

Exergen Super Plastic
Wins the Battle of Cracked Cases Caused by Chemical Disinfectants

Nearly 30 Times More Resistant to the Harshest Chemicals

Exergen has developed a new proprietary engineered plastic material for housings which resists the harshest chemical cleaners in use in hospitals at least 29 times longer than current materials.

After two years of research and testing, Exergen has succeeded in its objective of eliminating case cracking caused by harsh chemical disinfectants commonly used in hospitals. The proprietary Exergen Super Plastic cases are now used in all Exergen TemporalScanner TAT-5000 Series professional models.



TAT-5000

TAT-5000S

EXERGEN
TemporalScanner™

Convenience and Security Options

Wallmount 134201
(TAT-5000 not included)

Quick Release Security System:
124277 (Core) 124278 (Oral Equiv)
Includes TAT-5000, Wallmount
134201, Latex free coiled cable

Quick Release Security System:
124286 (Core) 124287 (Oral Equiv)
Includes TAT-5000, Wallmount
134201, 8' Latex free nylon
covered steel cable

Dual Security System
5 or 20 Temps before Lockout
5: 124280 (Core) - 124281 (Oral Equiv)
20: 124392 (Core) - 124393 (Oral Equiv)
Includes: TAT-5000, Requires
Keyless Locking Wallmount 134307

Quick Release Security System:
124288 (Core) 124289 (Oral Equiv)
Includes TAT-5000, Wallmount
134305, Latex free coiled cable

Quick Release Security System:
124290 (Core) 124291 (Oral Equiv)
Includes TAT-5000, Wallmount
134305, 8' Latex free nylon
covered steel cable

Dual Security System
5 or 20 Temps before Lockout
5: 124280 (Core) - 124281 (Oral Equiv)
20: 124392 (Core) - 124393 (Oral Equiv)
Includes: TAT-5000, Requires
Keyless Locking Wallmount 134308

Quick Release Security System:
124292 (Core) 124293 (Oral Equiv)
Includes TAT-5000, Wallmount
134306, Latex free coiled cable

Quick Release Security System:
124294 (Core) 124295 (Oral Equiv)
Includes TAT-5000, Wallmount
134306, 8' Latex free nylon

Roll-A-Bout
Part # 129455, 5-leg rolling stand,
double basket, 6' vinyl covered steel
cable, lock & key.

8' Security Cable
Part #124309 - Coiled Cable
Part #124311 - Latex Free Coiled Cable

Nylon Covered Steel Cable
Latex Free
6' Cable - Part #134302
8' Cable - Part #134030

- **Quick Release System:** A discrete method for easily removal and reattachment of the cable when required.
- **Dual Security System:** A system requiring return of the instrument to the holder after 5 or 20 temperature measurements.
- **Suggestions for Selection:**
  - If instruments are to be secured at the nurses' station, consider the keyless locking wallmount or Dual Security System.
  - If instruments are to be mounted one per bed, or in a dedicated area (e.g. triage), consider Quick Release System.
  - If instruments are to be attached to an existing rolling stand, or a vital signs monitor, consider the 6' vinyl covered steel cable 134302.

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TemporalScanner™

Infection Control Considerations

Methods of Cross-Contamination Protection: Unlike most other thermometers, the Exergen TemporalScanner does not come into contact with mucous membranes, and as such, the following options are available against the risk of cross-contamination when using the instrument between patients.

Alcohol Swabs: The vast majority of hospitals have approved wiping the probehead between patients with an alcohol swab or other disinfectant wipe, the typical method of choice for disinfecting the stethoscope diaphragm between patients, and the most cost effective method. 70% isopropyl alcohol is recommended.

Resposable/Disposable Covers:

Resposable/Disposable covers, meaning they can be used once and discarded, or reused on the same patient, are available for all levels of cross-contamination protection should they be preferred for certain patient populations, and are still very cost effective. These options include resposable caps and full instrument sheaths, the sheaths being mainly used for isolation patients.

Routine Maintenance:

With normal use, the only maintenance required is to keep the lens in the center of the probe clean. Periodic lens cleaning is a must. Dirt, greasy films or moisture on the lens will interfere with the passage of infrared heat and affect the accuracy of the instrument. Only alcohol should be used on the lens, and this warning is prominently affixed to the front of each instrument as shown on the right.

- Clean the lens with a cotton tipped stick applicator (Q-Tip, Cotton Bud, etc.)moistened in alcohol or with an alcohol swab.
- Twisting an alcohol swab to clean the lens is not recommended, a stick applicator must be used to reach and clean the little lens deep in the center of the probe head.
- Cleaning the little lens every two weeks (biweekly) is recommended.

Use of Aggressive Chemical Disinfectants for Decontamination:

Strong bleach-based and ammonium-based products have become very common due to heightened concerns regarding the risk of nosocomial infections, but these aggressive disinfectants can damage most plastics. Fortunately Exergen has developed and uses a proprietary “Super Plastic” that resists cracking by the harshest chemicals in use in hospitals.

Alcohol only applies to the IR sensor lens, as the bleach and ammonium based products may leave a residue on the sensor lens which would interfere with the accuracy of the measurement.

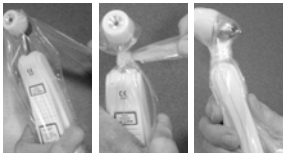
Further Information or Questions:

Please visit our Clinical Education Website at www.TAthermometry.org, or our Main Website at www.exergen.com, or contact service@exergen.com.

Using the Resposable/ Disposable Caps:

1. Apply cap by pushing onto the probehead with fingers.
2. Remove cap by pushing edge forward with thumb.
3. Caps may be reused on the same patient.

Using the Full Instrument Sheaths:



1. Insert instrument into sheath bottom end first. If instrument is on a cable, insert probe end first and twist sheath at neck with fingers to assure film is smooth over probe lens.
2. Wrap additional film around probe neck. Film should be smooth over probe lens.
3. Slide additional film under fingers while using.

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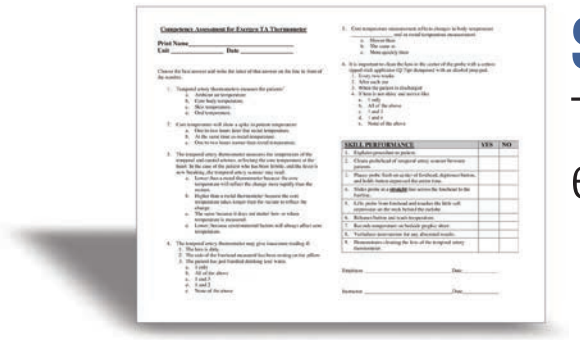
3-Step Method to Successful Inservicing

Actions Required of Nursing Staff:

Step 1:

View Exergen's Virtual Classroom Training Video.



Step 2:

Take the competency evaluation. (copy attached)

Step 3:

Provide a return demonstration to the satisfaction of the nurse educator.

Successful inservicing for the Exergen Temporal*Scanner* Thermometer is accomplished in just 3 well proven steps that follow below. Allowing 30 minutes for a Train-the-Trainer/Super Trainer or other classroom session incorporating the 3 steps below, and supervised by a nurse educator or a monitor, will accomplish the training goals of good patient care, in addition to eliminating unit based training, which is not only costly and disruptive to patient care, but has been proven ineffective for competent product training.

The Actions Required of Nursing Staff:

1. View Exergen's Virtual Classroom Training Video.
2. Take the competency evaluation (copy attached).
3. Provide a return demonstration to the satisfaction of the nurse educator or monitor.

The 3 Tools for Success:

1. **Exergen's Virtual Classroom Training Video**
   - **a.** A 15 minute training video containing the information to ensure staff is clinically and functionally skilled in the use of the Exergen Temporal*Scanner* Thermometers.
   - **b.** The Virtual Classroom is available on CD's and at www.exergen.com/virtualclassroom
   - **c.** Uploading to the hospital's intranet where all staff, including medical staff, can view PRN is highly recommended.
2. **Competency Evaluation**
   A multiple choice evaluation, the answers to which are contained in the video.
3. **Return Demonstration**
   Taking a temperature on another attendee to the satisfaction of the nurse educator or monitor prior to leaving the session takes just a few seconds and will assure proficiency.

Contacting Exergen with Clinical Questions or for Training Material:

Clinical Questions:
617-923-9900 x 6202
medical@exergen.com
www.TAThermometry.org

Training Material:
617-923-9900 x 6234
service@exergen.com
www.TAThermometry.org

For educational videos, clinical studies, & manuals:
www.exergen.com/ww

To evaluate, email:
medical@exergen.com

EXERGEN
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Competency Assessment
for Exergen TA Thermometer

EXERGEN
TemporalScanner™

Print Name:_____

Unit: _____

Date: _____

Choose the best answer and write the letter of that answer on the line in front of the number.

1. **Temporal artery thermometers measure the patients'**

   a. Ambient air temperature.
   b. Core body temperature.
   c. Skin temperature.
   d. Oral temperature.

2. **Core temperature will show a spike in patient temperature:**

   a. One to two hours later that rectal temperature.
   b. At the same time as rectal temperature.
   c. One to two hours sooner than rectal temperature.

3. **The temporal artery thermometer measures the temperature of the temporal and carotid arteries, reflecting the core temperature at the heart. In the case of the patient who has been febrile, and the fever is now breaking, the temporal artery scanner may read:**

   a. Lower than a rectal thermometer because the core temperature will reflect the change more rapidly than the rectum.

   b. Higher than a rectal thermometer because the core temperature takes longer than the rectum to reflect the change.

   c. The same because it does not matter how or where temperature is measured.

   d. Lower, because environmental factors will always affect core temperature.

4. **The temporal artery thermometer may give inaccurate reading if:**
   1. The lens is dirty.
   2. The side of the forehead measured has been resting on the pillow.
   3. The patient has just finished drinking iced water.

   a. 1 only
   b. All of the above
   c. 1 and 3
   d. 1 and 2
   e. None of the above

5. **Core temperature measurement reflects changes in body temperature _____ oral or rectal temperature measurement.**

   a. Slower than
   b. The same as
   c. More quickly than

6. **It is important to clean the lens in the center of the probe with a cottontipped stick applicator (Q-Tip) dampened with an alcohol prep pad.**
   1. Every two weeks
   2. After each use
   3. When the patient is discharged
   4. If lens is not shiny and mirror-like

   a. 1 only
   b. All of the above
   c. 1 and 3
   d. 1 and 4
   e. None of the above

Employee _____

Date_____

Instructor _____

Date_____

Competency Assessment answers located on inside back cover or at:
https://www.exergen.com/assessment

Clinical Studies

Peer-Reviewed Published Papers, Abstracts, Letters on Exergen Temporal Artery Thermometry as of May 14, 2018

1. Allegaert K, Casteels K, van Gorp I, Bogaert G. Tympanic, infrared skin, and temporal artery scan thermometers compared with rectal measurement in children: a real-life assessment. Curr Ther Res Clin Exp. 2014 May 8;76:34-8. doi: 10.1016/j.curtheres.2013.11.005. eCollection 2014.

2. Al-Mukhaizeem F, Allen U, Komar L, et al (University of Toronto/Hospital for Sick Children). Validation of the temporal artery thermometry by its comparison with the esophageal method in children. Pediatric Academic Societies Annual Meeting, May 3-6, 2003, Seattle, WA

3. Al-Mukhaizeem F, Allen U, Komar L, et al (University of Toronto/Hospital for Sick Children). Comparison of temporal artery, rectal and esophageal core temperatures in children: Results of a pilot study. Journal of Pediatric and Child Health, Vol 9, No 7, pp 461-465, 2004

4. Artz BA, March KS, Grim RD (WellSpan Health–York Hospital). Clinical Nurse Specialists empowering staff to improve patient outcomes in temperature measurement: from PI/EBP to nursing research. 2011 National Association of Clinical Nurse Specialists National Conference Abstracts, March 10-12, 2011, Baltimore MD

5. Bahorski J, Repasky T, Ranner D, Fields A, Jackson M, Moultry L, Pierce K, Sandell M (Tallahassee Memorial Healthcare). Temperature measurement in pediatrics: a comparison of the rectal method versus the temporal artery method. In Press, Corrected Proof, Available online 24 February 2011, Journal of Pediatric Nursing (2011).

6. Barringer LB, Evans CW, Ingram LL, Tisdale PP, Watson SP, Janken JK (Presbyterian Hospital Matthews). Agreement between temporal artery, oral, and axillary temperature measurements in the perioperative period. J Perianesth Nurs. 2011 Jun;26(3):143-50. 7.

7. Barry L, Branco J, et al. The impact of user technique on temporal artery thermometer measurements. Nursing Critical Care: September 2016 - Volume 11 - Issue 5 - p 12–14.

8. Batra P, Saha A, Faridi MM. Thermometry in children. J Emerg Trauma Shock. 2012 Jul;5(3):246-9.

9. Batra P, Goyal S. Comparison of rectal, axillary, tympanic, and temporal artery thermometry in the pediatric emergency room. Pediatr Emerg Care. 2013 Jan;29(1):63-6. doi: 10.1097/PEC.0b013e31827b5427.

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Clinical Studies (continued)

10. Beedle SE, Phillips A, et al. Preventing unplanned perioperative hypothermia in children. AORN J. 2017 Feb;105(2):170-183. doi: 10.1016/j.aorn.2016.12.002.

11. Bordonaro SF, McGillicuddy DC, Pompei F, Burmistrov D, Harding C, Sanchez LD. Human temperatures for syndromic surveillance in the emergency department: data from the autumn wave of the 2009 swine flu (H1N1) pandemic and a seasonal influenza outbreak. BMC Emerg Med. 2016 Mar 9;16(1):16. doi: 10.1186/s12873-016-0080-7.

12. Bradley SL, Kwater AP, et al. Is skin temperature measurement in PACU an accurate reflection of core temperature? ASA Abstract A3182, the Anesthesiology Annual Meeting 2016, http://www.asaabstracts.com

13. Bridges E, Thomas K (University of Washington). Noninvasive measurement of body temperature in critically ill patients. Crit. Care Nurse. 2009; 29(3): p. 94-97

14. Burdjalov VF, Combs A, Nachman S, Baumgart S (SUNY at Stony Brook). Non-Invasive infrared temperature assessment of the temporal artery for core temperature determination in premature neonates, Presented American Pediatric Society and the Society for Pediatric Research, May 1, 2001.

15. Callanan D (Christus Santa Rosa Children's Hospital). Detecting fever in young infants: reliability of perceived, pacifier, and temporal artery temperatures in infants younger than 3 months of age. Pediatr Emerg Care. 2003 Aug;19(4):240-3.

16. Calonder EM, Sendelbach S, Hodges JS, Gustafson C, Machemer C, Johnson D, Reiland L (Abbott Northwestern Hospital). Temperature measurement in patients undergoing colorectal surgery and gynecology surgery: a comparison of esophageal core, temporal artery, and oral methods. Journal of PeriAnesthesia Nursing, Volume 25, Issue 2, April 2010, Pages 71-78

17. Canales AE (Texas Tech University Health Sciences Center). OTC device: temporal scanner TAT-2000C. J Am Pharm Assoc (Wash DC). 2007 Jan-Feb;47(1):112.

18. Carleton E, Fry B, Mulligan A, Bell A, Brossart C. Temporal artery thermometer use in the prehospital setting. Canadian Journal of Emergency Medicine 2012;14(1):7-13

19. Carr EA, Wilmoth ML, Eliades AB, Baker PJ, Shelestak D, Heisroth KL, Stoner KH (Akron Children's Hospital). Comparison of Temporal Artery to Rectal Temperature Measurements in Children Up to 24 Months, Journal of Pediatric Nursing, In Press, [Epub ahead of print], Jan 25, 2010.

20. Carroll D, Finn C, Gill S, et al (Massachusetts General Hospital). A comparison of measurements from a temporal artery thermometer and a pulmonary artery catheter thermometer. Am J Crit Care. 2004;13:258.

Clinical Studies (continued)

21. Chiu SH, Anderson GC, Burkhammer MD (University of Akron/Case Western Reserve University). Newborn temperature during skin-to-skin breastfeeding in couples having breastfeeding difficulties. Birth. 2005 Jun;32(2):115-21.

22. Crossley B. Blanket warmers revisited and temporal thermometers. Biomedical Instrumentation and Technology, March/April 2012 p147.

23. Dybwik K, Nielsen EW. Infrared temporal temperature measurement. Journal of the Norwegian Medical Association 2003; 123: 3025-6.

24. Espenhein A (County Hospital in Herlev, Denmark). Temporal temperature measurement. Sygeplejersken 2006;(17):50-2.

25. Fetzer SJ, Lawrence A (Southern New Hampshire Medical Center). Tympanic membrane versus temporal artery temperatures of adult perianesthesia patients. J Perianesth Nurs. 2008 Aug;23(4):230-6.

26. Foy S, McGillicuddy D, Pompei F, Sanchez L (Beth Israel Medical Center, Boston MA). Body Temperature Surveillance and Reporting in the Emergency Department: A Practical Sentinel for Pandemics and Bioterrorism. Presented at Society for Academic Emergency Medicine Annual Meeting, Phoenix AZ , June 3-6, 2010.

27. Fratto L, Hogan K, Kenney K. Temporal artery thermometry use in pediatric patients in the post-anesthesia care unit. 2012 Research and EBP Abstracts ASPAN's 31st National Conference April 15-19, 2012, Orlando, FL Inf…2012 Research and EBP Abstracts - 8/1/2012 12:43:08 PM.

28. Furlong D, Carroll D, Finn C, Gay D, Gryglik C, Donahue V (2015). Comparison of Temporal to Pulmonary Artery Temperature in Febrile Patients. Dimensions of Critical Care Nursing. 2015 Jan-Feb; 34(1):47-52. doi: 10.1097/DCC.0000000000000090.

29. Greenes DS, Fleisher GR. (Boston Childrens Hospital and Harvard Medical School). Accuracy of a noninvasive temporal artery thermometer for use in infants. Arch Pediatr Adolesc Med, Vol 155, pp 376-381, Mar 2001

30. Greenes DS, Fleisher GR. (Boston Childrens Hospital and Harvard Medical School). When body temperature changes, does rectal temperature lag? Journal of Pediatrics, 02.037, pp 824-826, September 2004.

31. Gunawan M, Soetjiningsih I (Udayana University, Sanglah Hospital, Denpasar, Indonesia). Comparison of the accuracy of body temperature measurements with temporal artery thermometer and axillary mercury thermometer in term newborns. Paediatr Indones, Vol. 50, No. 2, March 2010.

Clinical Studies (continued)

32. Haddad, L., Smith, S., Phillips, K.D., and Heidel, R.E. (2012). Comparison of temporal artery and axillary temperatures in healthy newborns. Journal of Obstetric, Gynecologic, & Neonatal Nursing, 41, 383-388; doi: 10.1111/j.1552-6909.2012.01367.x

33. Hargreaves L. (2017) Toolkit for implementation of temporal artery thermometers for neonates. ProQuest Number 10603156, Published by ProQuest LLC (2017)

34. Harper CM (Royal Sussex County Hospital Brighton, UK). The need for an accurate noninvasive thermometer. Anesth Analg. 2009 Jul;109(1):288; author reply 288-9.

35. Hayes K, Shepard A, Cesarec A, et al. Cost minimisation analysis of thermometry in two different hospital systems. Postgrad Med J Published Online First: 18 January 2017, doi:10.1136/postgradmedj-2016-134630

36. Health Canada (2017). Summary Safety Review - Ear and Forehead (contact) Infrared Thermometers (various brands) - Assessing the potential risk of inaccuracy in children under 2 years old. https://www.canada.ca/en/health-canada/services/drugs-health-products/medeffect-canada/safetyreviews/ summary-safety-review-forehead-contact-infrared-thermometers-various-brands-assessing-potentialrisk- inaccuracy-children-under-2-years-old.html

37. Hebbar K, Fortenberry JD, Rogers K, Merritt R, Easley K. (Children's Healthcare of Atlanta at Egleston). Comparison of temporal artery thermometer to standard temperature measurements in pediatric intensive care unit patients. Pediatr Crit Care Med. 2005 Sep;6(5):557-61.

38. Hughes D. Study recommends use of professional temporal thermometer in adults. Oncology Nurse Advisor April 27, 2013.

39. Hurwitz B1, Brown J, Altmiller G. Improving pediatric temperature measurement in the ED. Am J Nurs. 2015 Sep;115(9):48-55. doi:10.1097/01.NAJ.0000471249.69068.73.

40. Isler, A., et al. Comparison of temporal artery to mercury and digital temperature measurement in pediatrics. Int. Emerg.Nurs. (2013), http://dx.doi.org/10.1016/j.ienj.2013.09.003

41. Kirk D, Rainey T, Vail A, Childs C (University of Manchester, Salford Royal Foundation Trust). Infra-red thermometry: the reliability of tympanic and temporal artery readings for predicting brain temperature after severe traumatic brain injury. Crit Care. 2009 May 27;13(3):R81. [Epub ahead of print]

42. Kumana C. Minimising the costs of temperature monitoring in hospitals. Postgrad Med J Published Online First: 1 February 2017 doi:10.1136/postgradmedj-2017-134795

Clinical Studies (continued)

43. Langham GE, Maheshwari A, Contrera K, You J, Mascha E, Sessler DI (Case Western Reserve University). Noninvasive temperature monitoring in postanesthesia care units. Anesthesiology, V 111, No 1, Jul 2009

44. Lawson L, Bridges E, Ballou I, Eraker R, Greco S, Shively J, Sochulak V. (University of Washington). Temperature measurement in critically ill adults. Am. J. Crit. Care., May 2006; 15: 324 - 346.

45. Lawson L, Bridges E, Ballou I, Eraker R, Greco S, Shively J, Sochulak V. (University of Washington). Accuracy and precision of noninvasive temperature measurement in adult intensive care patients. Am. J. Crit. Care., Sep 2007; 16:5, 485-496.

46. Lee G, Flannery-Bergey D, Randall-Rollins K, Curry D, Rowe S, Teague M, Tuininga C, Schroeder S (Exempla Lutheran Medical Center). Accuracy of temporal artery thermometry in neonatal intensive care infants. Advances in Neonatal Care, Vol. 11, No. 1, pp. 62-70, Feb 2011.

47. Makic MB, VonRueden KT, Rauen CA, Chadwick J. Evidence-based practice habits: putting more sacred cows out to pasture. Crit Care Nurse. 2011 Apr;31(2):38-61; quiz 62.

48. Martinez EA, Krenzischek D, Hobson D, Hunt D (Johns Hopkins Medical Institutions). The structure and processes of care delivery impact postoperative normothermia. Anesthesiology 2007; 107: A496.

49. Mason TM, Reich RR, et al. Equivalence of temperature measurement methods in the adult hematology/oncology population. Clin J Oncol Nurs. 2015 Apr;19(2):E36-40. doi: 10.1188/15.CJON.E36-E40.

50. McConnell E, Senseney D, George S, Whipple D. Reliability of temporal artery thermometers. Medsurg Nursing 2013, Nov-Dec 2013, Vol. 22/No. 6, p387

51. Merrill, K. (Seattle Children's Hospital). Comparison of temporal artery temperature m easurement with standard temperature measurement in critically ill children. American Journal of Critical Care. 2014, May, 23(3), e23.

52. Moore AH, Carrigan JD, Solomon DM, Tart RC. Temporal artery thermometry to detect pediatric fever. Clin Nurs Res. 2015 Oct;24(5):556-63. doi: 10.1177/1054773814557481. Epub 2014 Nov 14.

53. Myny D, DeWaele J, Defloor T, Blot S, Colardyn F (Ghent University Hospital, Ghent, Belgium). Temporal scanner thermometry: a new method of core temperature measurement in intensive care patients. SMJ 2005 45(1): 15-18.

54. Opersteny, Esther et al. Precision, sensitivity and patient preference of non-invasive thermometers in a pediatric surgical acute care setting. Journal of Pediatric Nursing: Nursing Care of Children and Families , 2017, Volume 35 , 36 – 41.

Clinical Studies (continued)

55. Pappas M. Understanding the different methods for taking a temperature. NASN School Nurse 2012 27: 254 originally published online 5 July 2012.

56. Paul IM, Sturgis SA, Yang C, Engle L, Watts H, Berlin CM Jr (Penn State College of Medicine). Efficacy of standard doses of Ibuprofen alone, alternating, and combined with acetaminophen for the treatment of febrile children. Clin Ther. 2010 Dec;32(14):2433-40.

57. Pittman R and Waters R (CaroMont Health Care, Gastonia, NC). Do our patients have hypothermia? Temporal versus oral thermometers. Journal of PeriAnesthesia Nursing Volume 24, Issue 3, June 2009, Page e18.

58. Pompei F, Pompei M. Non-invasive temporal artery thermometry: Physics, Physiology, and Clinical Accuracy, presented at Medical Thermometry for SARS Detection, SPIE Defense and Security Symposium, available in Conference Proceedings, April, 2004.

59. Pompei F. Insufficiency in thermometer data. Anesth Analg. 2003 Mar;96(3):908-9.

60. Pompei F. RE: A brief report on the normal range of forehead temperature as determined by noncontact, handheld, infrared thermometer. Am J Infect Control. 2006 May;34(4):248-9.

61. Pompei F. Misguided guidelines on noninvasive thermometry. Crit Care Med. 2009 Jan;37(1):383; author reply 383-4.

62. Reynolds M, et al. Are temporal artery temperatures accurate enough to replace rectal temperature measurement in pediatric ED patients? J Emerg Nurs. 2012 Nov 8. pii: S0099-1767(12)00329-7. doi: 10.1016/j.jen.2012.07.007. [Epub ahead of print]

63. Rollins K, Flannery-Bergey D. Accuracy of temporal artery thermometry in neonatal intensive care unit infants. JOGNN, 40, S85-S119; 2011. DOI: 10.1111/j.1552-6909.2011.01243.x

64. Routhier D, Hostler D, Wolfson A, Wheeler M, Reynolds J (University of Pittsburgh). Comparison of temporal artery and oral temperatures in the emergency department. ACAD EMERG MED, May 2006, Vol. 13, No. 5, Suppl. 1, www.aemj.org , p. S99

65. Roy S, Powell K, Gerson LW (Akron Children's Hospital). Temporal artery temperature measurements in healthy infants, children, and adolescents. Clinical Pediatrics, pp 433-437, June 2003.

66. Sandlin D (Southern Hills Medical Center, Nashville TN). New Product Review: Temporal Artery Thermometry, Journal of PeriAnesthesia Nursing, Vol. 18, No 6 (December) 2003, pp 419-421.

Clinical Studies (continued)

67. Schuh S, Komar L, Stephens D, Chu L, Read S, Allen U (University of Toronto/Hospital for Sick Children). Comparison of the temporal artery and rectal thermometry in children in the emergencydepartment. Pediatric Academic Societies Annual Meeting, May 3-6, 2003, Seattle, WA.

68. Schuh S, Komar L, Stephens D, Chu L, Read S, Allen U (University of Toronto/Hospital for Sick Children). Comparison of the temporal artery and rectal thermometry in children in the emergency department. Pediatric Emergency Care, Vol 20, No. 11, Nov 2004

69. Siberry GK, Diener-West M, Schappell E, Karron RA (Department of Pediatrics, School of Medicine, The Johns Hopkins University). Comparison of temple temperatures with rectal temperatures in children under two years of age. Clinical Pediatrics, pp 405-414, July/August 2002.

70. Smith et al. Comparison of axillary and temporal artery thermometry in preterm neonates. J Obstet Gynecol Neonatal Nurs. 2018 Apr 3. pii: S0884-2175(18)30052-2. doi: 10.1016/j.jogn.2018.02.013. [Epub ahead of print]

71. Szmuk P, Curry BP, Sheeran PW, Farrow-Gillespie AC, Ezri T (UT Southwestern and Children's Medical Center, Dallas, Texas). Perioperative temperature audit in a large pediatric hospital. Anesthesiology 2007; 107: A1612.

72. Tan GM, Galinkin JL, Pan Z, Polaner DM. Laryngeal view and temperature measurements while using the perilaryngeal airway (Cobra-PLUS™) in children. Pediatric Anesthesia 2013, Dec; 23(12):1180-6. doi:10.1111/pan.12266. Epub 2013 Sep 25.

73. Titus MO, Hulsey T, Heckman J, Losek JD (Medical University of South Carolina and Children's Hospital). Temporal artery thermometry utilization in pediatric emergency care. Clinical Pediatrics, Mar 2009; vol. 48: pp. 190 - 193.

74. Yang WC, Kuo HT, et al. Tympanic temperature versus temporal temperature in patients with pyrexia and chills.Medicine (Baltimore). 2016 Nov;95(44):e5267.

Ensuring Cost Savings Reality…
by Virtual Innovation

Virtual Classroom ensures cost savings, waste reduction, and enhanced patient care by training and supporting millions of caregivers in new thermometry technology. So exactly how does it work?

Francesco Pompei is Founder and CEO of Exergen Corporation, and holds 60 US patents in noninvasive thermometry for medical and industrial applications. Earning BS and MS degrees from MIT, and an SM and PhD from Harvard, Dr. Pompei also holds an appointment as Research Scholar in the Dept of Physics at Harvard.

What is the cost savings reality you are referring to?

Francesco Pompei. Temporal artery thermometry (TAT) has produced an estimated $100 million in direct cost savings and 10,000 tons of waste reduction in the last few years for healthcare institutions. For a typical 300-bed hospital, this translates to nearly $100,000 in unnecessary costs and two tons of waste eliminated per year. Furthermore, a recent independent study reported that TAT also saves 87 percent of nursing time used for taking temperature.

These are certainly impressive numbers. How does new thermometry technology do this?

FP. TA thermometry lightly scans the intact skin of the forehead, placing it in the same category as a stethoscope – simply clean between patients with the same wipe used

with the stethoscope. Conventional thermometry systems require a probe to be inserted into a body cavity, which in turn requires robust protection from contamination by applying a single-use disposable cover. Th e dramatically reduced use of disposable probe covers is a major benefi t from TA thermometry, eliminating approximately 90 percent of the direct cost of providing this vital sign. In addition, since there is no small fragile probe to be inserted into a body cavity, TAT can be designed to be far more robust than conventional thermometry, and can carry a lifetime warranty. This not only eliminates direct repair costs, but also greatly reduces all of the indirect costs, such as removal of equipment from service, evaluation by biomedical engineering, return to the manufacturer, receipt of the repaired device and reinstallation to service. Since typical payback for TA thermometry is measured in months, hospitals using TAT have effectively eliminated the cost of patient temperature as a vital sign.

How can you provide technology training and support for millions of caregivers without substantially increasing your own costs?

FP. Comprehensive training for new technology always carries a very high cost, particularly a technology that is used as extensively (millions of users) and across as many skill sets (MDs to RNs to PCAs) as thermometers. Th e supplier's cost in providing this training necessarily has to be passed along as part of the cost of the thermometry system. For the older thermometry systems, the unending stream of payments from disposables and repairs paid for the costs of training and support. For TAT, since only 10 percent of the cost of the older thermometry systems is available as revenue, we had to innovate to preserve the savings for hospitals. There is also a substantial cost for the hospital in maintaining competency levels on all equipment used in patient care, which new technology should not increase, but preferably reduce. Th is is where avatars and the Virtual Classroom come into play.

EXERGEN
TemporalScanner™

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Why avatars in a Virtual Classroom?

FP. Because we found that everyone is fascinated by this medium, and enjoys and pays attention to the content. Training videos, written materials, and even personal in-servicing tend to be boring and are oft en ineff ective, requiring frequent and expensive follow-up by both supplier and hospital educators. Avatars are compelling. The movie of the same name, vast numbers of video games, and extensive social networking are testament to the their effectiveness in capturing the attention of the viewers, which is the most important element in training and support of millions of users. The Virtual Classroom presents familiar scenes and interactions for clinicians, but with avatars substituted for real people.

An important cost advantage to the supplier is the ease in which the Virtual Classroom can be updated to include new training, new products, or new methods. In turn, this lower cost translates into lower cost for TAT users in healthcare.

What convinced you that it would work?

FP. When fi ve senior physicians in a major university teaching hospital crowded around an iPhone's three-inch screen, watched intently, requested a replay, and then described it as "brilliant", we knew we were on the right track. When 35 nurses crowded around an iPad's 10-inch screen, watched intently, laughed at the avatar interactions as similar to their real life colleagues, and exclaimed "such a great idea" we knew our primary audience would be engaged. And the fi nal test was when 1000 nurses and PCAs were trained for TAT by viewing the Virtual Classroom on a large projection screen. Th e subsequent written competency exam was passed by 100 percent of the attendees, and the return demonstration was passed by 99.9 percent on the fi rst try. Prior to the Virtual Classroom, the initial pass rates on personal in-servicing could be as low as 50 percent, which was costly for both supplier and hospital to remedy. The Virtual Classroom is a major improvement and cost benefit for both hospital and supplier.

How do sales people respond to the Virtual Classroom?

FP. With a standing ovation. First they learned what they needed to know very quickly and effi ciently, and then realized how easily they could provide excellent training and support for their customers by employing the Virtual Classroom.

How about Nurse Educators?

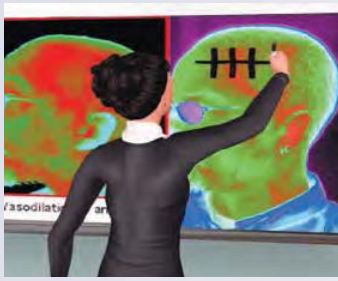
FP. They immediately embraced the Virtual Classroom, as it made it possible for them to assure correct training on new technology, without increasing costs. Th is is particularly important given the staff reductions that many hospitals are facing. Nurse Educators have become strong advocates of the Virtual Classroom as an important tool to help them do their jobs.

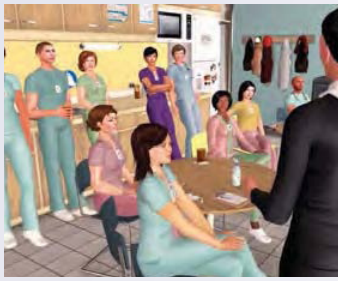
How are hospitals implementing Virtual Classroom?

FP. By uploading the Virtual Classroom to their intranet, all clinicians have convenient access at all times. This allows staff to review the TAT science and methods at their convenience rather than at specific times that might compete with patient care. Those without an intranet provide a Virtual Classroom CD to all nursing units. The Virtual Classroom also includes internet links for more detailed clinical information.

How much does the Virtual Classroom cost the hospital?

FP. Zero. We provide this tool free of charge. The Virtual Classroom copyright explicitly gives permission for any use in connection with TAT. A convenient flash version is also available at **www.exergen.com/virtualclassroom** that can be accessed anytime. High resolution CDs are available on request by emailing **medical@exergen.com** .





Renewing the Oldest Vital Sign

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Fever was known as a vital sign to ancient Egyptians at least 5000 years ago, using the hand as measuring instrument. Galileo invented the first thermometer 500 years ago. CarlWunderlich, 'Father of Clinical Thermometry,'proposed 98.6°F (37°C) as themean normal temperature 140 years ago. Until very recentlywe have been taking patients' temperatures more or less the same way for more than 100 years, circa 10 billion measurements per yearworldwide (approximately half in the US). Can we improve on what we have been doing for thousands of years and countless billions of times? Emphatically yes.

Today's patient expectations

Importantly, today there is a much higher patient expectation of non-invasiveness. After all, the 10 billion temperaturesmean a similar number of probe insertions into a body cavity, causing discomfort and unnecessary indignity, as well as some risk of harm. Patients undergoing cancer treatment are grateful for a reprieve from things that hurt, when their temperature is taken with the latest non-invasive methods. It is not uncommon today for a parent to refuse to permit a rectal thermometer to be used on their child.

Non-invasiveness is unachievable if the vital sign lacks the necessary clinical accuracy. The scientific and engineering challenge is to accurately measure thetemperature inside, from the outside. From medical science we have learned that certain external locations have useful properties for ascertaining internal temperature.The ear, forexample, has a 50-year history of investigation for thermometry, and in the last 20 years devices developed on this principle have been widely used. Although perhaps less invasive than oldermethods, inserting a probe into an ear is notwhat patients consider non-invasive. Further, there are accurac yproblems,particularlywithsmallchildren.

Back to the future

As inventor ofmuch of the ear thermometer technology in use, Exergen was asked by physicians to reconsider non-invasive thermometry, since ear thermometers were not an acceptable solution to the patients' requirement for non-invasiveness and the clinicians' requirement for accuracy. Within this context we re-examined the medical science of fever assessment, going back not 50 years, but 5000 years, to the hand on the forehead.

Although never precise enough for clinical accuracy, laying a hand on the forehead provided useful fever indications under certain conditions, and was safe, gentle and a reassuring caress for the patient. Preserving these desirable attributes while making the measurement robust and reliably accurate for clinical use for all ages was the challenge. Our mathematical models indicated we needed to find an easily accessible external skin surface with high and consistent perfusion. We found this property at the superficial temporal artery, where it traverses the forehead. A measurement modality was developed based on scanning the temperature of the skin over the temporal artery, and with proprietary algorithms we could then accurately compute the internal core temperature, for all ages, under essentially all clinical conditions.

In the past five years Temporal Artery Thermometry has become widely accepted and is resp0nsible for about 0.5 billion temperatures per year by medical professionals in the US, a very good start in reducing the number of probe insertions into body cavities and improving the clinical experience for both patients and clinicians. About two million consumers have home versions for their personal use.

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Future with zero cost and zero waste

An unexpected benefit of Temporal Artery Thermometry is that without insertion into a body cavity there is no requirement for disposable probe covers, and simple wiping is adequate. Thus, future operating budgets for thermometry in institutions using only Temporal Artery Thermometers are zero. Furthermore, with disposable waste eliminated, the institution contributes significantly to 'green' operations, while reducing storage space and handling costs. In the past two years, US institutions have saved approximately $40 million in disposable costs, and 3000 tons in disposable waste.With Temporal Artery Thermometry initial cost is about the same as other thermometry devices available and acquisition cost is usually less than one year of disposables cost, thereby not requiring capital budgeting.

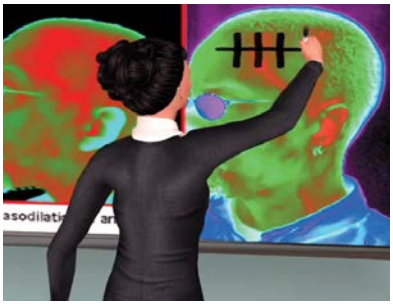
Answer key to Competency Assessment — 1: b, 2: c, 3:. a, 4: d 1, 5: c, 6: d.

New Independent Studies Show
Exergen Reduces Hospital Costs by 90% Compared to Other Thermometers

"Yielded clear-cut cost savings that increased exponentially with increasing duration of use and increasing bed numbers per device."

[1] Hayes K, Shepard A, Cesarec A, et al. Cost minimisation analysis of thermometry in two different hospital systems. Postgrad Med J Published Online First: 18 January 2017, doi:10.1136/postgradmedj-2016-134630

- **Patients love the TemporalScanner!**
- **Cost savings of 90% over other thermometry methods**
- **Lifetime Warranty – unique to thermometry**
- **Chemical resistant materials stand up to harsh disinfectants**
- **On-demand, innovative, inservicing results in successful usage for all levels of nursing skills**



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TemporalScanner™

To evaluate, email:
medical@exergen.com

For general information:
www.exergen.com

For clinical information, visit:
www.TAThermometry.org

For educational videos, clinical studies, and manuals:
www.exergen.com/ww

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The Exergen Temporal*Scanner* Temporal Artery Thermometer