

Introduction

Instrument traceability has been developed in our CSSD since 2009, in order to meet regulatory requirements and to allow the task transfer from surgical nurses to sterilization agents for the instruments assembly. Instruments are marked individually with Data Matrix codes by dot peening (DP) or by laser etching (L). The aim of this study was to compare the reading time of two data matrix code readers, Dataman 7500[®]-Cognex (DTM) and White Reader[®]-ATH (WR) according to the type of marking system and the instrument surface.

Materials and methods

Two code readers are compared :

- White Reader[®] (WR) ATH
- Dataman 7500[®] (DTM) Cognex

→ Used with three colors lighting red, green and blue (RGB) or with red lighting only (R)



Two marking techniques are used :

- Dot peen marking (DP) *in situ*
 - Carried out in our CSSD with the c52V-2 system (SIC MARKING)
 - 3x3 mm code size including 8 characters
 - Peen force 3
- Laser etching (L)
 - Carried out by Petel society
 - 5x2 mm code size including 26 characters



DP Codes



Laser Codes

Test 1 : instruments with dot peen codes (DP)

- 2 code readers compared : DTM and WR RGB
- 20 DP instruments assigned to four groups according to surface type
- 2 operators realized 10 code readings for each instruments
- Comparison of the mean reading time by instrument between each code readers
- Comparison of the percentage of unsuccessful reading (= Reading time > 30 s)

Allocation of instruments according to their surface type (wear, surface finish) :

1. Bright (new) and Shining
2. Dark (worn) and Shining
3. Bright (new) and Matt
4. Dark (worn) and Matt



Group 1



Group 2



Group 3



Group 4

Test 2 : instruments with DP codes

- 3 code readers : DTM, WR RGB and WR R
- 30 DP instruments from the same surgical set
- 3 operators realized 3 readings of the set with each code reader
- Comparison of the mean reading time between code readers for the whole set
- Comparison of the percentage of unsuccessful reading (= Reading time > 30 s)

Test 3 : instruments with Laser codes (L)

- 2 code readers : DTM et WR RGB
- 19 L instruments from the same surgical set
- 3 operators realized 3 readings of the set with each code reader
- Comparison of the mean reading time between code readers for the whole set
- Comparison of the percentage of unsuccessful reading (= Reading time > 30 s)

Statistical Tests :

- We used the multiple comparison test of Tukey-Kramer for Test 1
- Khi2 and Student test in Tests 2 and 3
- For all tests, a P value of < 0.05 was considered significant

Results

Table I : Mean reading time by DP instrument, and percentage of unsuccessful reading (UR) (= reading time > 30 s) (Test 1). Results are reported in seconds with standard deviations.

TEST 1	WR	DTM	
Number of reads	400	400	
Percentage of UR	3.8	0	P<0.001
Mean reading time all instruments	8.4 [6.9]	4.9 [2.5]	P<0.001
Subgroups			
Bright and Shining	4.8 [2.2]	4.6 [1.5]	
Dark and Shining	5.0 [2.6]	4.8 [2.9]	
Bright and Matt	12.0* [9.8]	4.5 [2.2]	
Dark and Matt	12.0* [10.7]	5.6** [3.0]	

*,** Significant difference (P<0.05) considering one surface type compared to the others, in the same code reader group.

Table II : Mean reading time for the whole surgical set containing DP instruments and percentage of unsuccessful reading (UR) (= reading time > 30 s) (Test 2).

TEST 2	DTM	WR R	WR RGB
Percentage of UR	0.4*	3.7	7.4
Mean reading time	3.17 min*	3.23 min**	4.18 min

* Significant difference with the WR R and WR RGB groups.
** Significant difference with WR RGB group.

Table III : Mean reading time for the whole surgical set containing L instruments and percentage of unsuccessful reading (UR) (Test 3).

TEST 3	DTM	WR RGB	Difference
Percentage of UR	10.5	10.5	P>0.05 (NS)
Mean reading time	1.55 min	1.45 min	P>0.05 (NS)

Discussion- Conclusion

These tests showed :

- for the DP instruments, the DTM reader had the shortest reading time, was less variable according to the instrument surface type, and had the lowest percentage of unsuccess reading,
- for the L instruments, there was no significant difference between the two code readers.

The reading time of a code reader depends on the surface of instruments, the code size or the marking technique. As currently in our hospital instruments are marked mostly by dot peening with 3x3mm codes, then the DTM remains the most effective reader. However, as the DataMatrix laser codes are increasingly miniaturized, especially by the manufacturers themselves, a new evaluation will be necessary to characterize the most suitable reader.