

The BSCI radiation dose audit 2016-2017: final analysis

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Radiation doses for cardiac CT

- scientific literature
 - +++ references
 - few multi-centre surveys
 - PROTECTION I (2010), II (2010) and III (2012) national data
- first UK survey carried out by BSCI in 2014
 - 50 centres, 1341 CCTA exams

parameter	median value
BMI	28 kg/m ²
HR	60 bpm
exam DLP	209 mGycm

BSCI dose audit 2016-2017

- aims:
 - evaluate effect of improvements in practices and technology on radiation dose
 - gather new data on
 - timing of acquisition
 - dependence of radiation dose on BMI
 - determine right dose for right patient

BSCI dose audit 2016-2017

- questionnaire sent out Oct 2016
 - completed at scanner side for each individual exam
 - ≥ 50 CCTA exams
- data analysed locally
 - instructions provided
- data collection period closed May 2017

exam details		
date	exam type	clinical indications
dd/mm/yy		

patient details			
year of birth	height	weight	beta blockers given?
yyyy	m	kg	BMI

coronary Ca score	
CTDIvol	DLP
mGy	mGycm

coronary CTA series				
acquisition		acquisition	CTDIvol	DLP
HR bpm	technique	chosen window	mGy	mGycm

exam summary
total exam DLP
mGycm

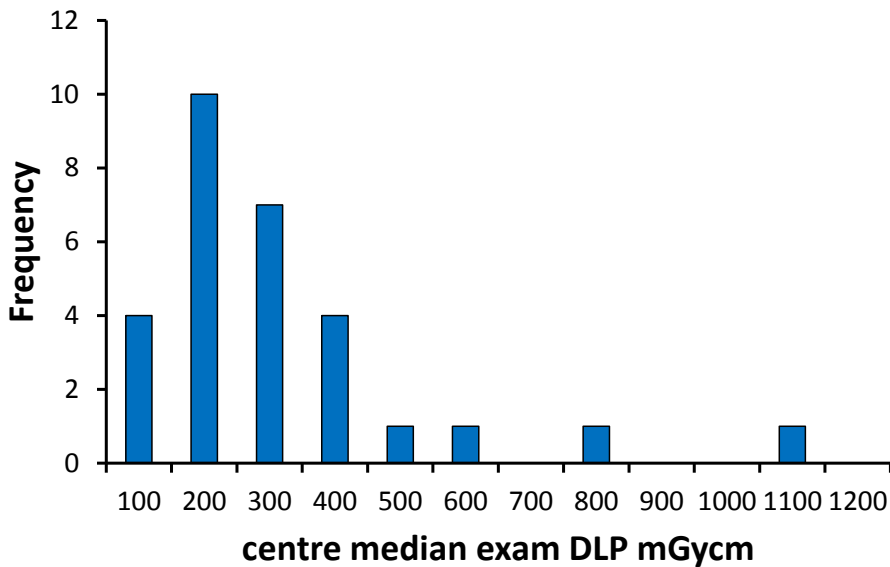
Results

- data on 46 scanners (50 in 2014)
 - 29 (20) centres completed own detailed analysis
- 36 centres carried out > 50 CCTA exams
 - in 2014, 28 centres carried out >20 CCTA exams

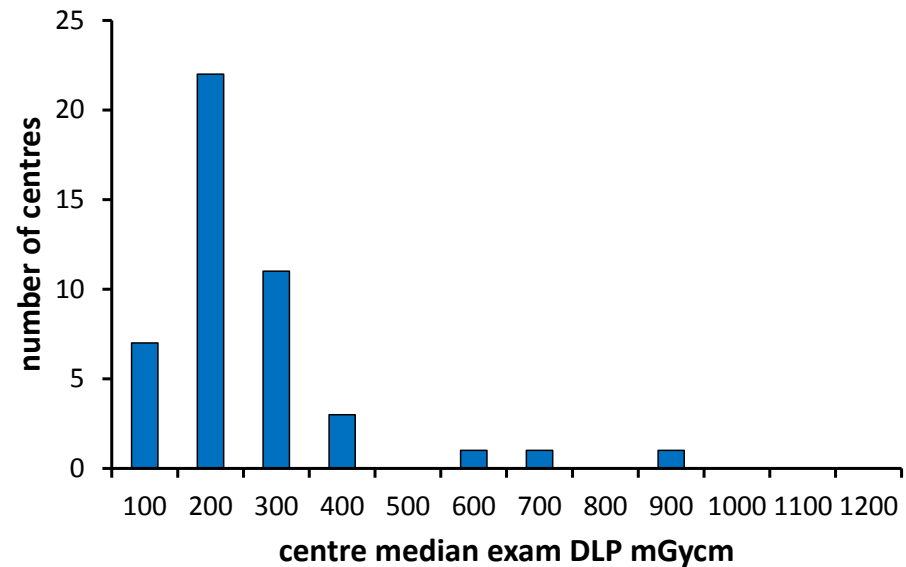
	% patients given beta blockers	BMI kg/m²	HR bpm	exam DLP mGycm
median of centre medians 2016/17	65 (48-77)	28 (27-28)	60 (58-61)	171 (121-224)
median of centre medians 2014	69 (59-80)	28 (27-29)	60 (58-62)	209 (133-318)

Results

- BMI and HR normally distributed
- exam DLP skewed distribution
 - shift toward lower doses



2014



2017

Results

- coronary CTA data filtered according to ECG gating technique
 - 32 (19) centres with at least 20 exams in one category included

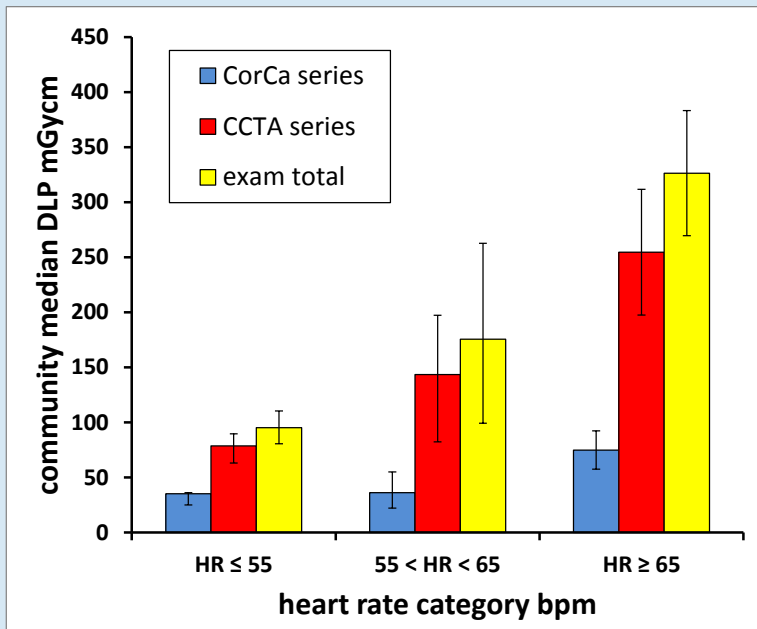
	prospective, no padding	prospective, with padding	retrospective, with mA pulsing
2016/17 median exam DLP mGycm	130 (93-170) n=32	182 (133-234) n=15	353 (319-453) n=3
2014 median exam DLP mGycm	119 (92-173) n=11	257(245-283) n=5	321 (256-381) n=5

n= number of centres

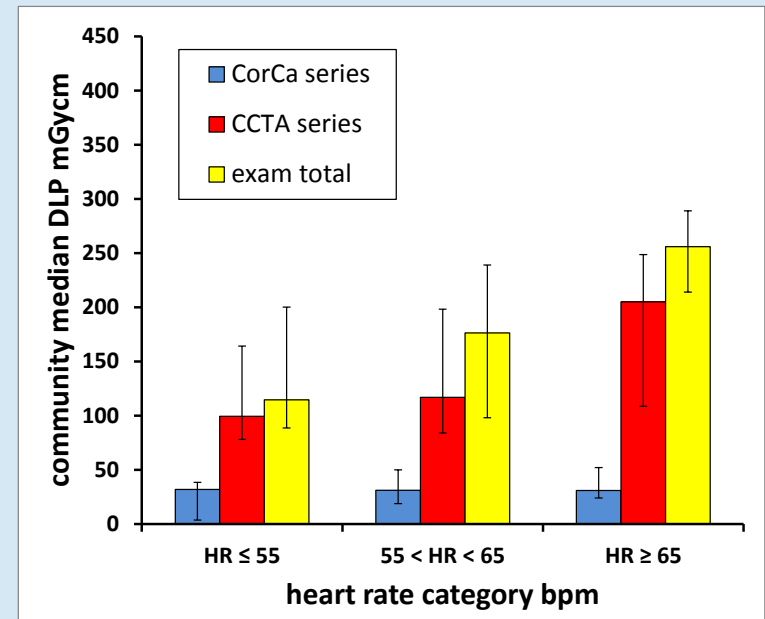
- 94% exams performed at end diastole

Results

- coronary CTA data for standard-sized patients with BMI 25 - 31kg/m² filtered according to heart rate
 - 36 (19) centres with at least 8 exams in one category included



2014

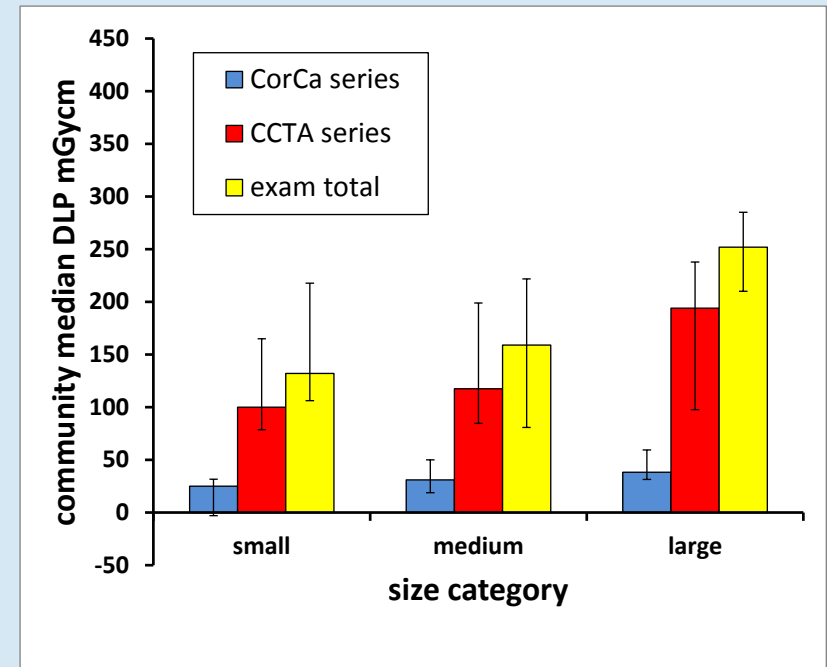


2017

Results

- coronary CTA data for patients with HR 55-65 bpm filtered according to weight / BMI
 - 39 (n/a) centres with at least 8 exams in one category included

	small	medium	large
BMI kg/m ²	≤ 25	25 < BMI < 31	≥ 31
weight kg	≤ 70	70 < weight < 90	> 90



Discussion

- 18% decrease in median exam DLP
- 29% decrease in median exam DLP for prospective gating with padding
 - x 1.4 DLP without padding (x 2.2 in 2014)
 - confusion about terminology?
 - less padding used?
- 94% exams performed at end diastole
- very little data for retrospective gating
- less variation in median exam DLP with HR
- median exam DLP varies with BMI as expected

Next steps

- publication of national DRL for CCTA
 - as part of larger PHE initiative
 - agreed in principle
 - proposal: 320 mGycm based on 2014 audit
 - c.f. 370 mGycm (prospective), 970 mGycm (retrospective) proposed for France*
- publication of 2016-2017 audit

*Mafalanka et al Radiat Prot Dosim 164 (2015) 116-119

Acknowledgements

- BSCI committee
- CT Users Group
- radiographers, radiologists and physicists in UK cardiac CT scanning centres