



Strategies to promote accurate diagnosis of osteoporosis to meet WHO standards in Taiwan

Wing P. Chan^{1,2,*}, Yi-Chien Lu,¹ Hsing-Fen Hsiao,¹ Ying Chin Lin³

¹ Department of Radiology, Wan Fang Hospital, Taipei Medical University, Taipei, Taiwan,

² Department of Radiology, School of Medicine, College of Medicine, Taipei Medical University, Taipei, Taiwan,

³ Department of Family Medicine, School of Medicine, College of Medicine, Taipei Medical University, Taipei, Taiwan

* wingchan@tmu.edu.tw

Presentation 10 mins, Q&A 10 mins.

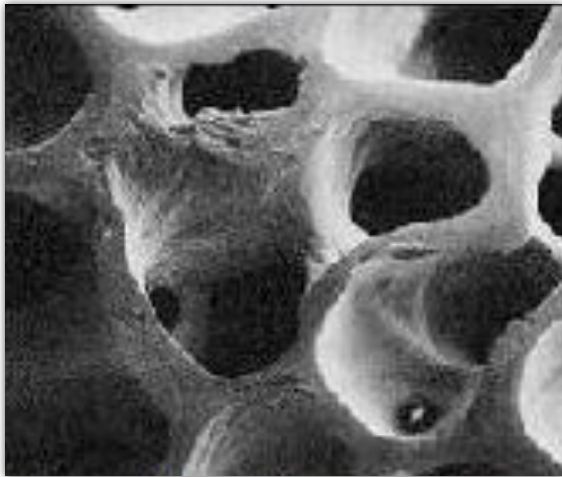
1:00-2:30 PM Section, 20 Sept 2019

E5 Autumn/Winter Room, Taipei Marriot Hotel

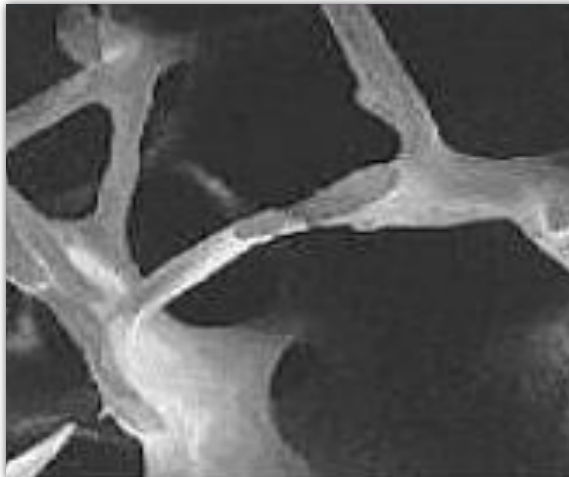


The essence of quality measurement

- ◆ How we improve diagnosing osteoporosis **accurately** to meet WHO standard?
- ◆ How we develop standards of practice using DXA scans to achieve **best practices**?
- ◆ How we **educate** healthcare professionals nationwide?
- ◆ How we intend to **spread** and **sustain** accurate diagnosis of osteoporosis nationwide?



Normal Bone

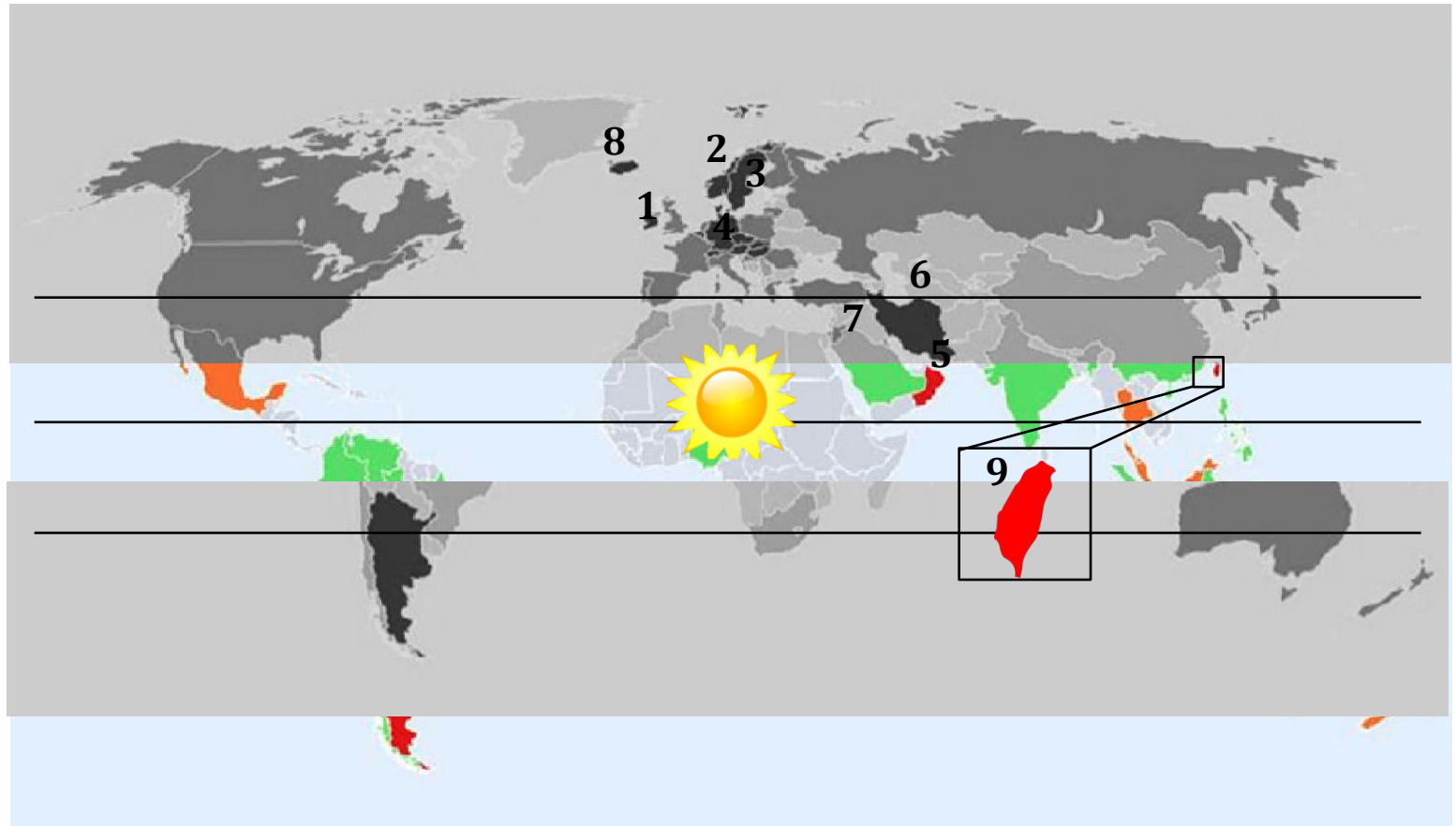


Osteoporotic
Bone



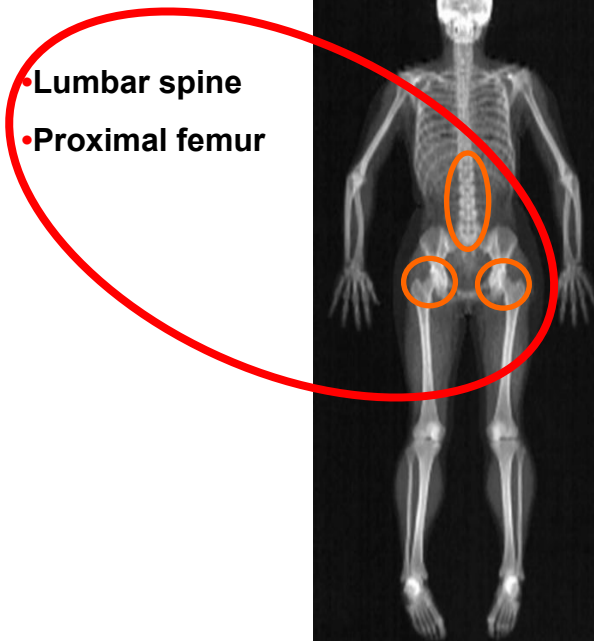
Hip fracture rate in Taiwan – Very high

The incidence of hip fracture in Taiwan (F, 299/100,000) is reportedly the **highest in Asia** and the **9th highest worldwide**.



Osteoporosis in Taiwan - Underestimation

- ◆ In Taiwan, most hospitals conducted BMD measurements with DXA at only **one** skeletal site and use **Asian** data as reference standard before 2016, the prevalence of osteoporosis can be underestimated.



In our study, **56.1%** of patients with spine compression fractures were not classified as osteoporosis if the Asian reference was used.

	Spine	
	T _{Asian}	T _{US/white}
Female		
Osteoporosis	43.86	60.09
Low bone mass	36.84	31.14
Normal	19.30	8.77

Lu CH, et al. IOF Regionals 6th Asia-Pacific Osteoporosis Meeting, Singapore, Singapore, November 4-6, 2017, page 117.

Strategies for change



1. Follow the ISCD recommendation

- To measure BMD at **3** skeletal sites, and to use **NHANES III** data as the reference standard, which has been initiated from our institution nationwide.

2. Require mandatory training of radiology residents

- To complete a **6-hour course** in DXA and osteoporosis, and to read **120 scans** before certifying them as specialists as required by our radiological society.

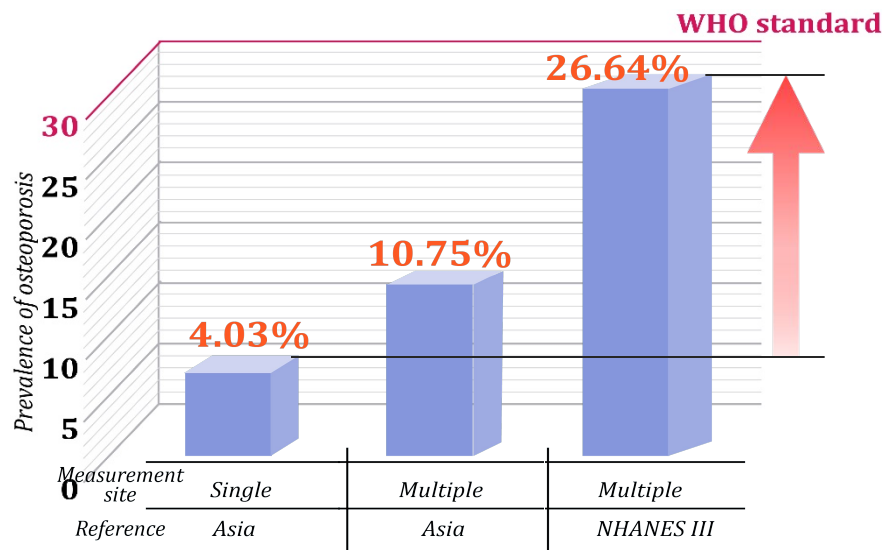
3. Train DXA technologists for best practices

- To modify 18 practice items from ISCD guidance and develop additional **4-practice standards** in scan acquisitions and analyses for quality improvement (QI) training to achieve DXA best practices in Taiwan.

4. Automatically report via a standard format

- To develop the **rule-based** ISCD guidelines, and to identify the location of each compression fracture vertebra, which has been developed and promoted at our institution.

Follow the ISCD recommendation



- ◆ **N=3740** health exam. with DXA (Jan 2007 – Dec 2014)
F, 1712 (58.13 ± 2.7 y)
M, 2028 (58.23 ± 2.8 y)
- ◆ The prevalence of osteoporosis in postmenopausal women increased **>2-fold** using the lowest T-score measured across **3** vs. 1 skeletal sites with DXA scans.
- ◆ Using ISCD-recommended **NHANES III** data as reference standard resulted in an osteoporosis detection rate of 26.64%, which is close to the **30%** in Caucasian postmenopausal women.

Diagnosis	Spine		Right femur		Left femur		Multiple sites	
	T _{Asia} *	T _{USA} *	T _{Asia}	T _{USA}	T _{Asia}	T _{USA}	T _{Asia}	T _{USA}
Males (n = 2028)								
Osteoporosis (age ≥ 50 y)	1.82	6.41	2.22	16.07	2.07	15.15	4.29	21.20
50–59	1.51	5.52	1.74	14.15	1.51	12.78	3.18	18.76
60–69	1.60	6.91	2.30	15.25	2.30	16.31	4.61	21.28
70+	5.63	12.68	7.75	36.62	6.34	32.39	13.38	43.66
Low bone mass (age ≥ 50 y)	17.90	33.88	34.70	54.57	33.93	54.74	41.72	57.94
50–59	18.46	35.48	32.07	54.08	31.16	54.54	39.86	59.23
60–69	16.67	31.03	37.06	58.51	36.17	56.56	44.50	59.40
70+	17.61	30.28	47.18	41.55	50.70	48.59	47.89	40.14
Normal (age ≥ 50 y)	80.28	59.71	63.07	29.36	63.91	30.11	53.99	20.86
50–59	80.03	59.00	66.11	31.69	67.25	32.60	56.96	22.01
60–69	81.74	62.06	60.11	25.71	61.35	26.95	50.89	19.33
70+	76.76	57.04	44.37	21.13	42.96	19.01	38.73	16.20

meet WHO
standard

Promote our experience in Taiwan

- ◆ The Taiwanese Osteoporosis Association (TOA) and the Radiological Society of the ROC (RSROC) adopted the standards for BMD measurement

=> *Consensus meeting on 2015.11.22*

- ◆ The TOA issued a letter specifying the standards to be adopted by medical institutions in Taiwan

=> *Official letter on 2018.01.26*

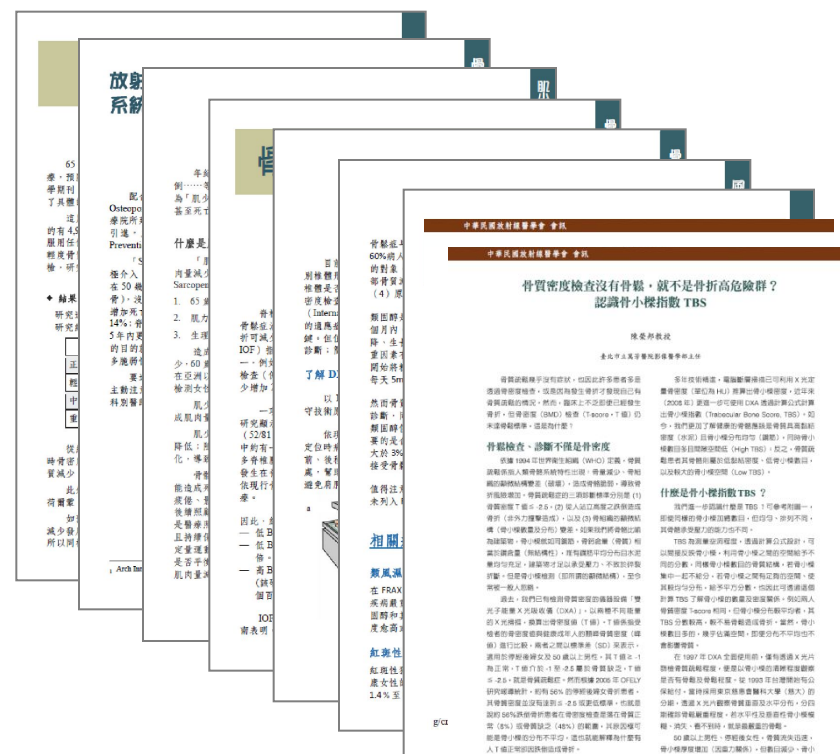
- ◆ The TOA included the standards in the Guidelines for the Prevention and Treatment of Osteoporosis in Taiwan.

=> *TOA guidelines in 2019.07*

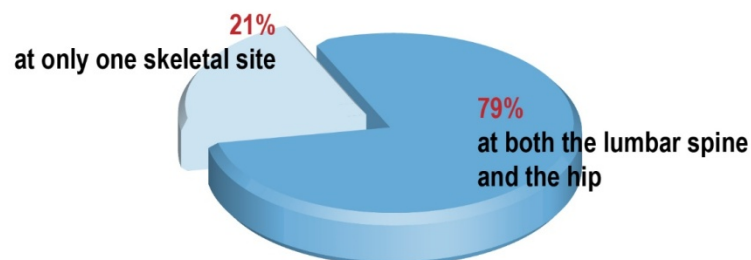
- ◆ The RSROC surveyed 38 institutes across the country

=> *RSROC survey in 2018. 5*

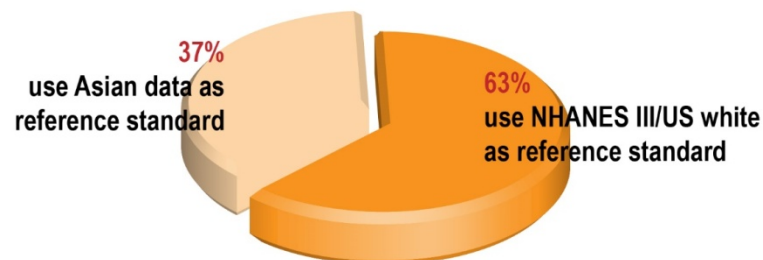
RSROC & TOA – Newsletters (1~9)



BMD measurement sites

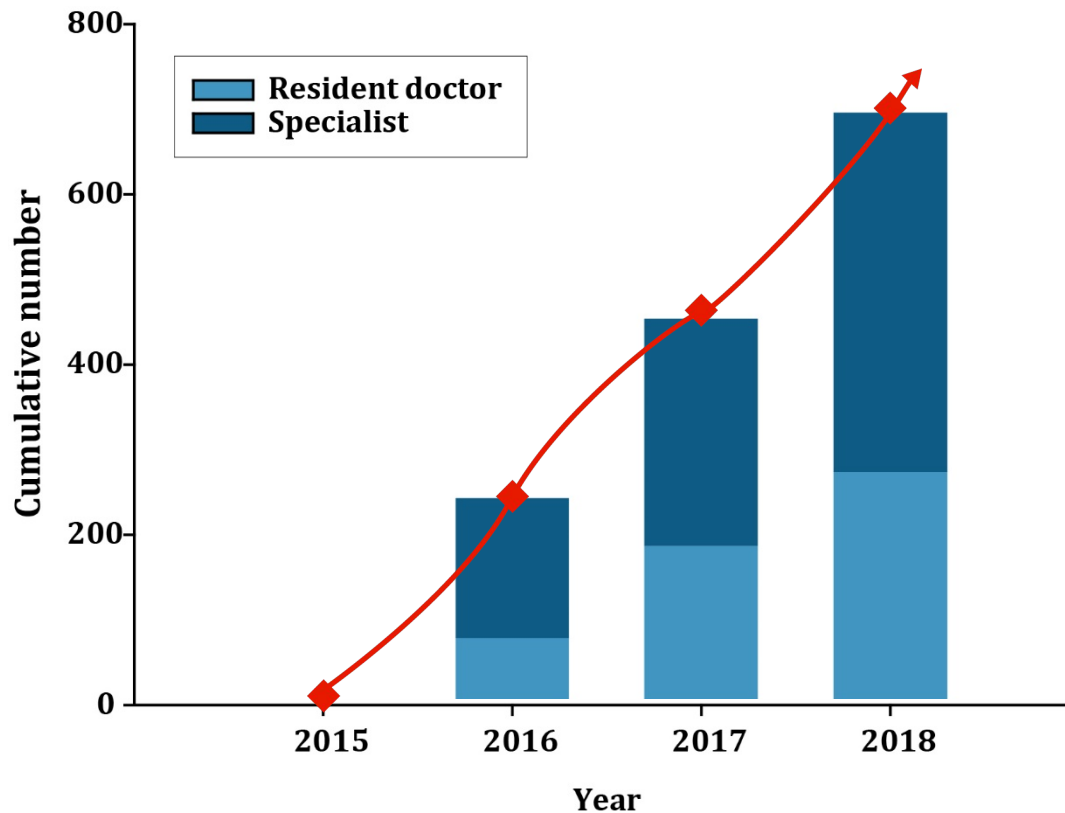


Usage of reference database

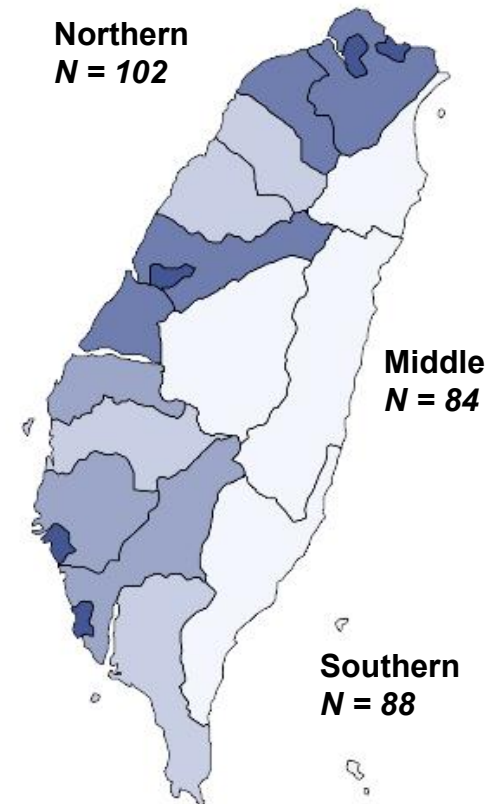


Require mandatory training of radiology resident doctors

- ◆ A total of **696** trainees have completed the training courses from 2015 to 2018 in Taiwan.



Radiology residents (N=274)

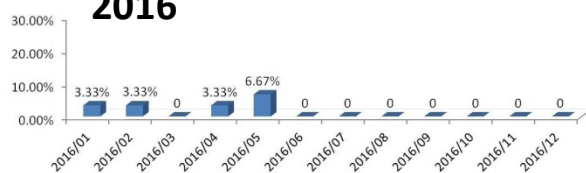


Train DXA technologists for best practices

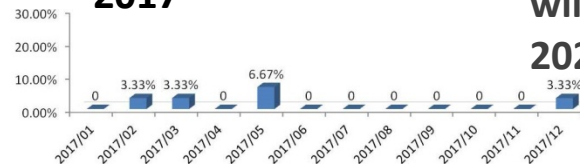
2015 Suboptimal scans



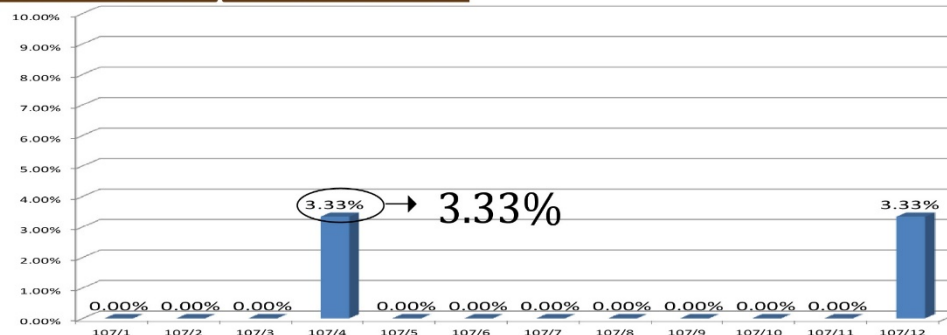
2016



2017



2018 Suboptimal scans

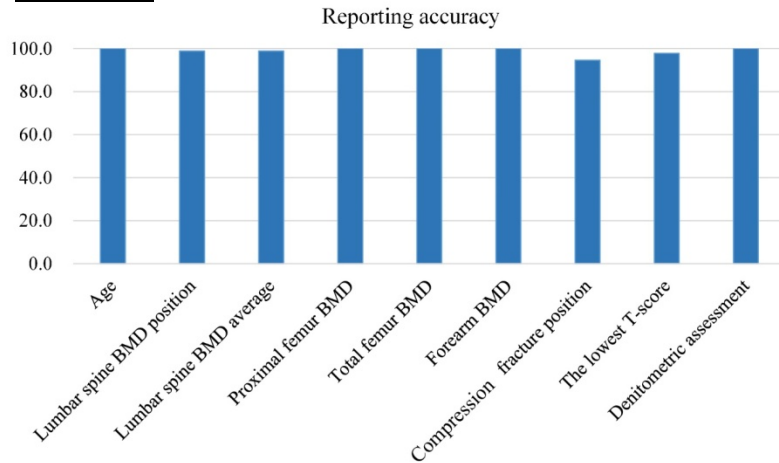


- ◆ After QI training, suboptimal scans declined from 66.7% to **3.3%** of the samples.
- ◆ This model won the ISCD 2019 **award**.
- ◆ The RSROC adopted the standards for DXA **Best Practices**, which site-visit will be implemented in 2020.



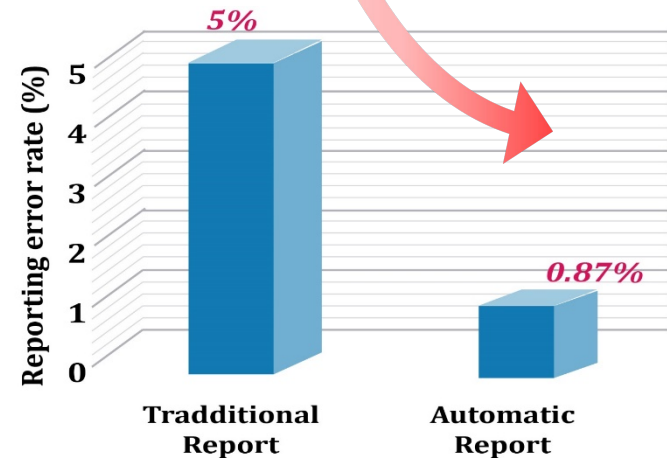
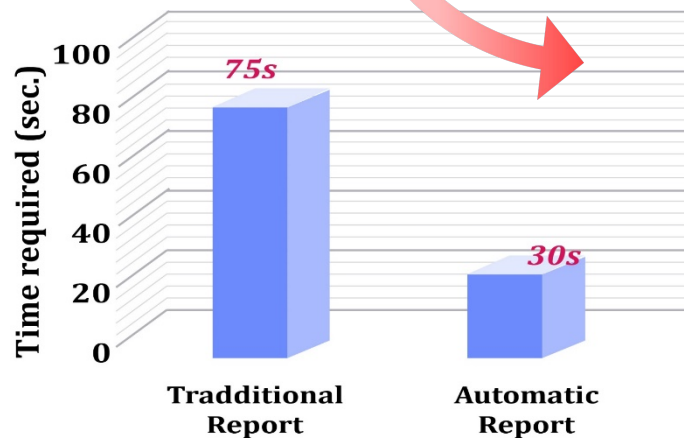
Automatically report follows ISCD standard

N = 1000



- ◆ The automatic reporting system can improve **efficiency** and **accuracy** of BMD analysis and reporting.
- ◆ Diagnosis and integrated assessment remains the responsibility of the reporting **doctors**.
- ◆ **Patent** application has been filed.

N = 345



Lessons learnt

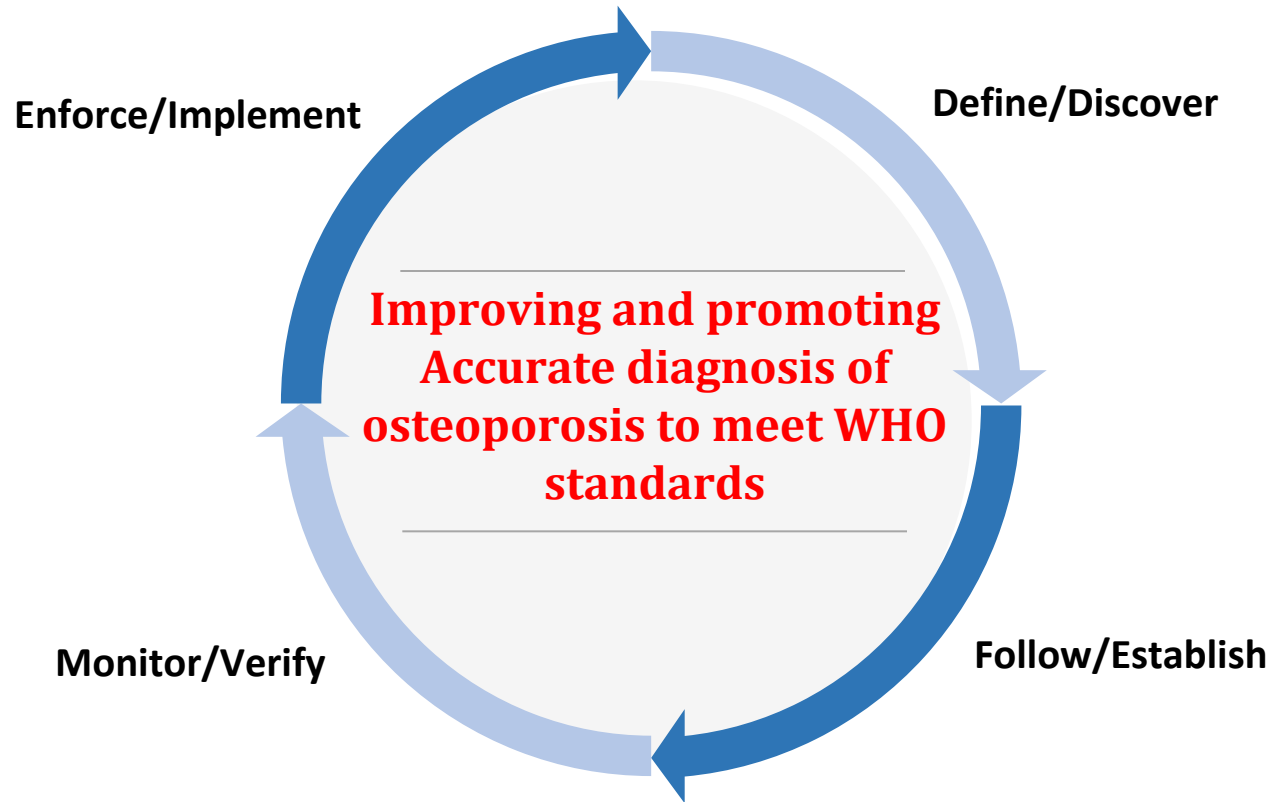
- ◆ We implemented a series of **strategies** to promote the accurate diagnosis of osteoporosis, meeting WHO standards in Taiwan.



- ◆ How we improve diagnosing osteoporosis accurately to meet WHO standard?
 - Examine multiple skeletal sites
 - Use NHANES III database
- ◆ How we develop standards of practice using DXA scans to achieve best practices?
 - Modify ISCD guidance
 - Establish DXA best practices
- ◆ How we educate healthcare professionals nationwide?
 - Set mandatory training policy
- ◆ How we intend to spread and sustain accurate diagnosis of osteoporosis nationwide ?
 - Develop rule-based automatic analysis and reporting system

Message for others

- ◆ Optimizing DXA practices and reporting system have improved the **historic** underestimation of osteoporosis in Taiwan.
- ◆ Measures of diagnostic **accuracy** is the essence of quality measurement.



References

1. Kanis JA, et al. A systematic review of hip fracture incidence and probability of fracture worldwide. *Osteoporos Int* 2012, 23, 2239–56
2. Lu CH, et al. Prevalence of osteoporosis and low bone mass in postmenopausal women with vertebral compression fractures. IOF Regionals 6th Asia-Pacific Osteoporosis Meeting, Singapore, Singapore, November 4-6, 2017, page 117.
3. Lu YC, et al. Prevalence of osteoporosis and low bone mass in older Chinese population based on bone mineral density at multiple skeletal sites. *Sci Rep* 2016; 6, 25206.
4. Huang WC, et al. An information-extracting and rule-based analytic system for reporting bone mineral density and body composition. The 25th Annual Scientific Meeting of the International Society for Clinical Densitometry (ISCD) in Kuala Lumpur, Malaysia, March 20-23, 2019