2024年 福島県立医科大学『県民健康調査』国際シンポジウム
公立大学法人福島県立医科大学放射線医学県民健康管理センター
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2024 Fukushima Medical University International Symposium on the Fukushima Health Management Survey
Secretariat of International Symposium
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The Current Status of the Thyroid Ultrasound Examination and Scientific Findings

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COI Disclosures

Nothing to disclose

Topics

Current progress of the Thyroid Ultrasound Examination (TUE) in the Fukushima Health Management Survey

Findings of TUE1

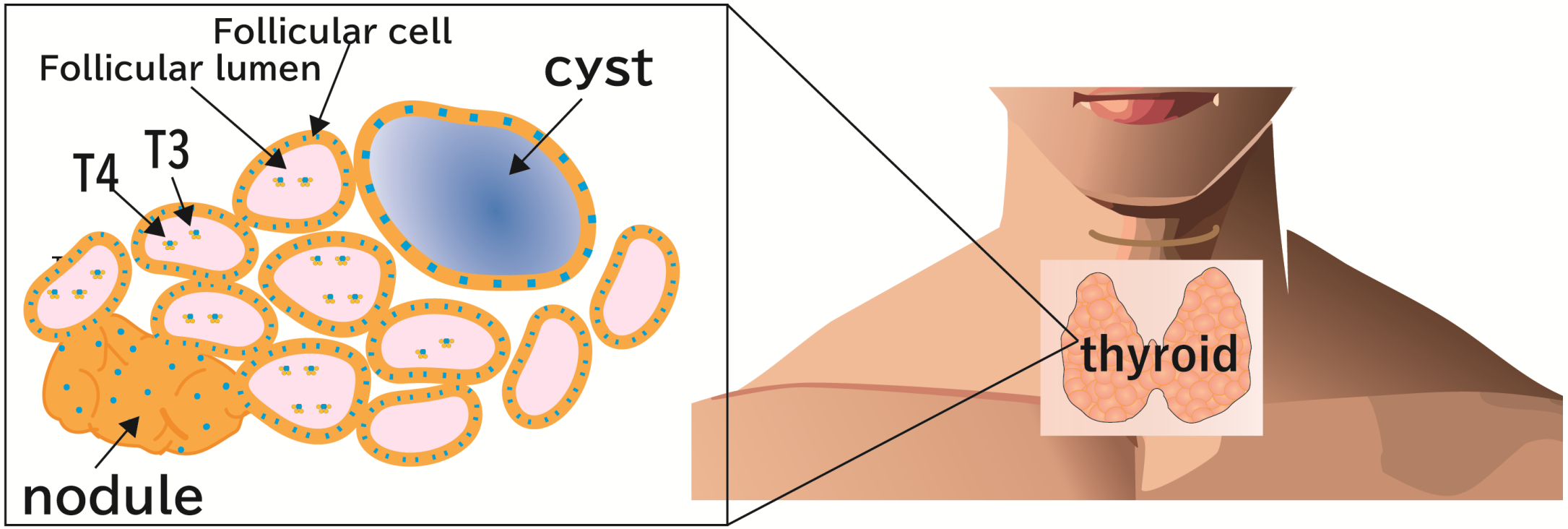
Association between radiation exposure and detection rate of thyroid cancer

Findings of TUE2

Confounding factors other than radiation associated with the detection rate of thyroid cancer

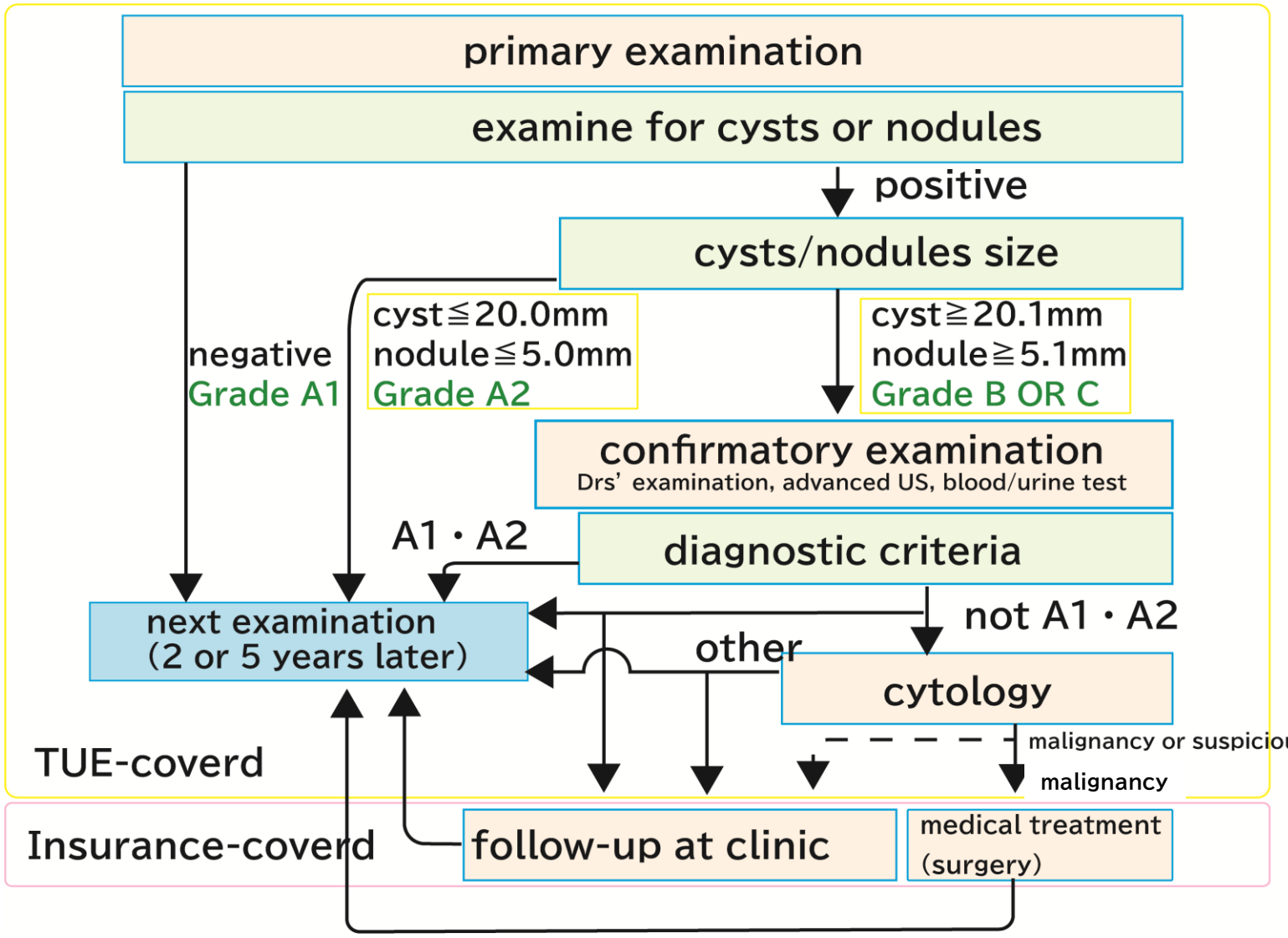
Current Status and Future of the TUE

Structure and function of thyroid gland

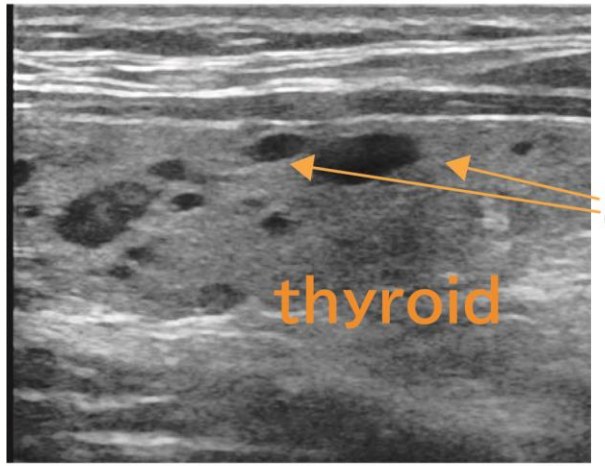


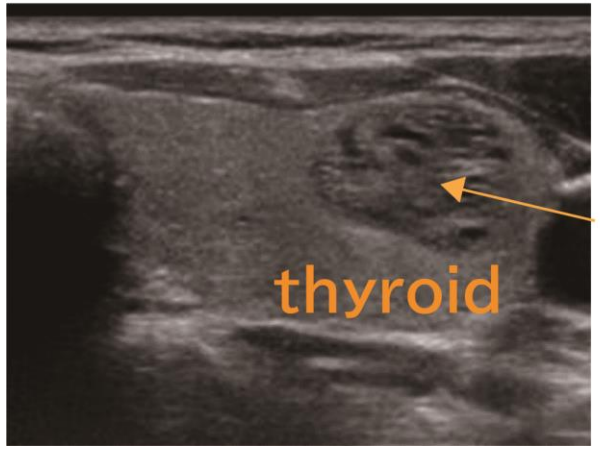
The thyroid gland produces and releases thyroid hormones (T4 and T3) from iodine. Fluid-filled ”cysts” and hyperplastic ”nodules” of follicular cells sometimes are observed in the thyroid gland.

Flow chart of Thyroid Ultrasound Examination（TUE）program



ultrasound images





Outline of TUE

	survey category	implementation period	coverage
1st round	Preliminary baseline survey (aiming to check the baseline condition of participants' thyroid gland)	From October 2011 to March 2014	Residents of Fukushima prefecture aged 18 years and younger as of March 11, 2011
2nd round 〜 5th round	Full-scale Survey (for comparison with the preliminary baseline survey) 	From April 2014 to March 2016 〜 From April 2020 to March 2023	Residents who were born between April 2, 1992 and April 1, 2012 Eligible participants are invited to receive thyroid ultrasound examination every two years through the age of 20, and then at five-year intervals after the age of 25.

Summary of TUE results

counted as of September 30, 2023

		Preliminary baseline survey 1st round*	Full-scale survey 2nd round**	Full-scale survey 3rd round **	Full-scale survey 4th round****	Full-scale survey 5th round	Survey for 25	Survey for 30
Fiscal years		2011-2013	2014-2015	2016-2017	2018-2019	2020-2022	2017-	2022-
Persons eligible for primary exam		367,637	381,237	336,667	294,228	252,938	129,006	22,625
Primary exam participation (%)		81.7%	71.0%	64.7%	62.3%	45.0%	9.2%	6.9%
Result	A1	51.5%	40.2%	35.1%	33.6%	28.8%	42.5%	44.6%
	A2	47.8%	59.0%	64.2%	65.6%	70.0%	52.0%	46.9%
	B	0.8%	0.8%	0.7%	0.8%	1.2%	5.5%	8.6%
	C	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Persons eligible for confirmatory exam		2,293	2,230	1,502	1,394	1,346	647	134
Confirmatory exam participation (%)		92.9%	84.2%	73.5%	74.3%	78.8%	84.2%	79.9%
Malignant or suspected for malignancy		116	71	31	39	43	23	5
Persons who underwent surgery		102	56 ***	29	34	34	17	3
Pathological diagnosis	Papillary carcinoma	100	55 ***	29	34	34	16	3
	Poorly differentiated carcinoma	1						
	Other variant		1				1	
	Benign	1						

*counted as of March 31, 2018 **counted as of March 31, 2021
***counted as of March 31, 2022 ****counted as of June 30, 2022

Association between radiation exposure and detection rate of thyroid cancer

Estimation of personal internal exposure dose (thyroid equivalent dose)

1. As internal exposure doses, thyroid equivalent doses (mSv) exposed from tap water + inhalation for 14 days after the nuclear power plant accident were estimated based on the detailed version of behavior report in the Basic Survey form from March 12 to March 25, 2011.
2. External exposure doses were calculated by multiplying the doses assessed in the Basic Survey by the correction factor of 1.1.
3. Cases were those with nodules cytologically diagnosed as malignant or suspicious for malignancy in the first- to fourth-round surveys, the survey for 25 years (born in from FY1992 to FY1994), and cases of those in the Cancer Registry with a year of diagnosis from 2012 to 2018 who have behavior records in the “Basic Survey.”
4. Controls with behavior records were matched to cases by sex, year of birth, malignancy or suspicion of malignancy through participation in all corresponding rounds leading to the diagnosis (or corresponding year of diagnosis in the Cancer Registry), it would be the year of diagnosis as to the respective round), and were randomly selected at a ratio of 1:3 cases to controls.

Characteristics of cases and controls in the case-control study

(Cases were selected in TUE and National Cancer Registry)

	Cases	Controls	Total
Cases (M or SM) (n)	153	0	153
Controls (n)	0	459	459
Age at the earthquake (mean)	12.9	12.9	12.9
Thyroid equivalent dose (mSv)			
Median	2.3	2.1	2.1
Min – Max	0.11–22.70	0.10 – 21.84	0.10 – 22.70
Grade B or C (%)	96.1	1.7	25.3

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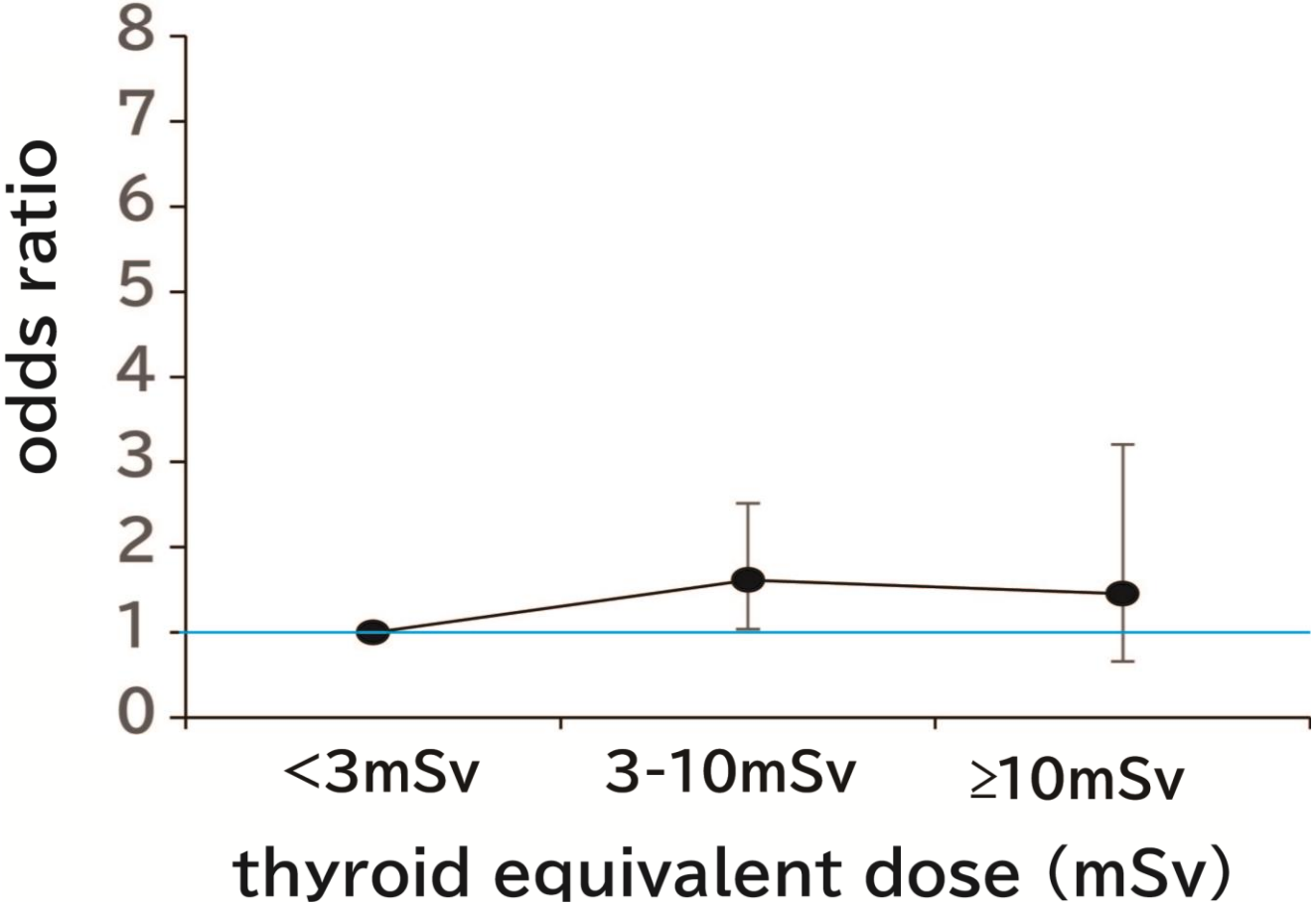
Odds ratio for detection of nodules diagnosed as malignant or suspicious for malignancy in each thyroid equivalent dose group

cases selected in TUE and
National Cancer Registry



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There is no statistical dose-response relationship between the ”detection rate of nodules diagnosed as malignant or suspected malignant” and “radiation dose.”

Confounding factors other than radiation associated with the detection rate of thyroid cancer

counted as of September 30, 2023

		Preliminary baseline survey 1st round*	Full-scale survey 2nd round**	Full-scale survey 3rd round **	Full-scale survey 4th round****	Full-scale survey 5th round	Survey for 25
Fiscal years		2011-2013	2014-2015	2016-2017	2018-2019	2020-2022	2017-
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	Poorly differentiated carcinoma	1					
	Other variant		1				1
	Benign	1					

*counted as of March 31, 2018 **counted as of March 31, 2021
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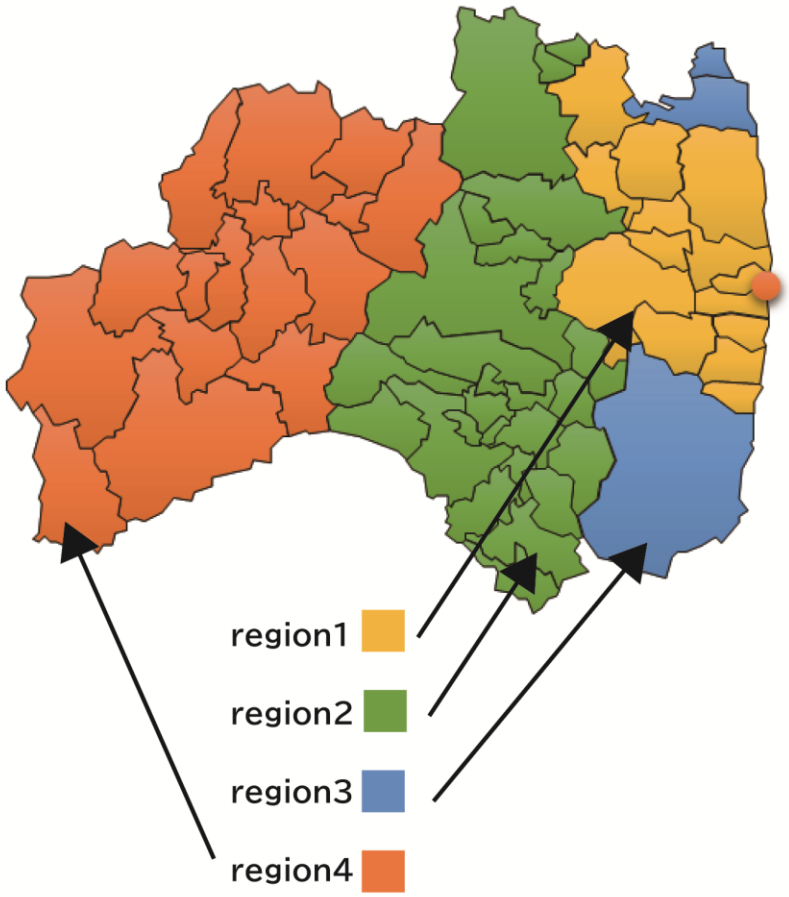
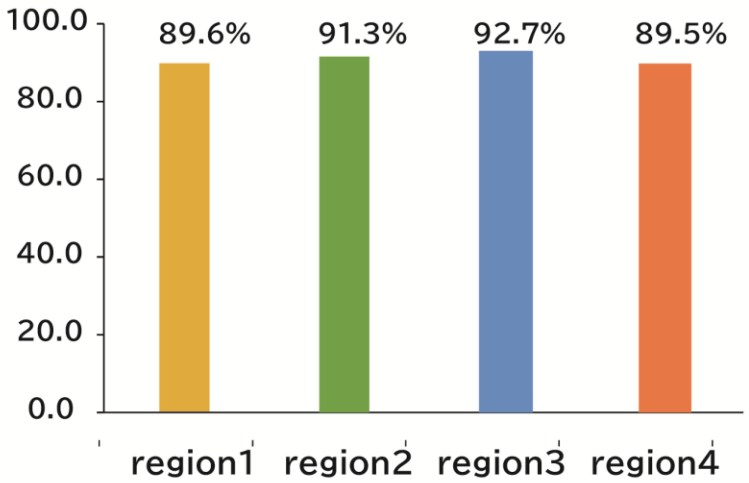
Regional differences and changes in the participation rate of confirmatory examination

Fukushima Prefecture



1st round survey



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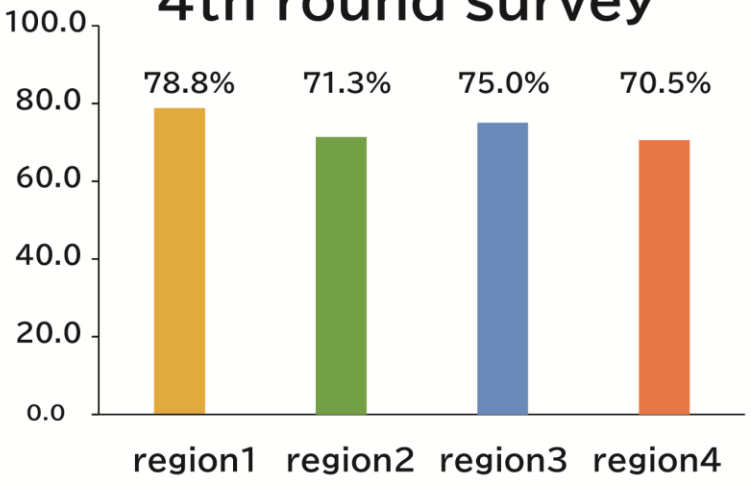
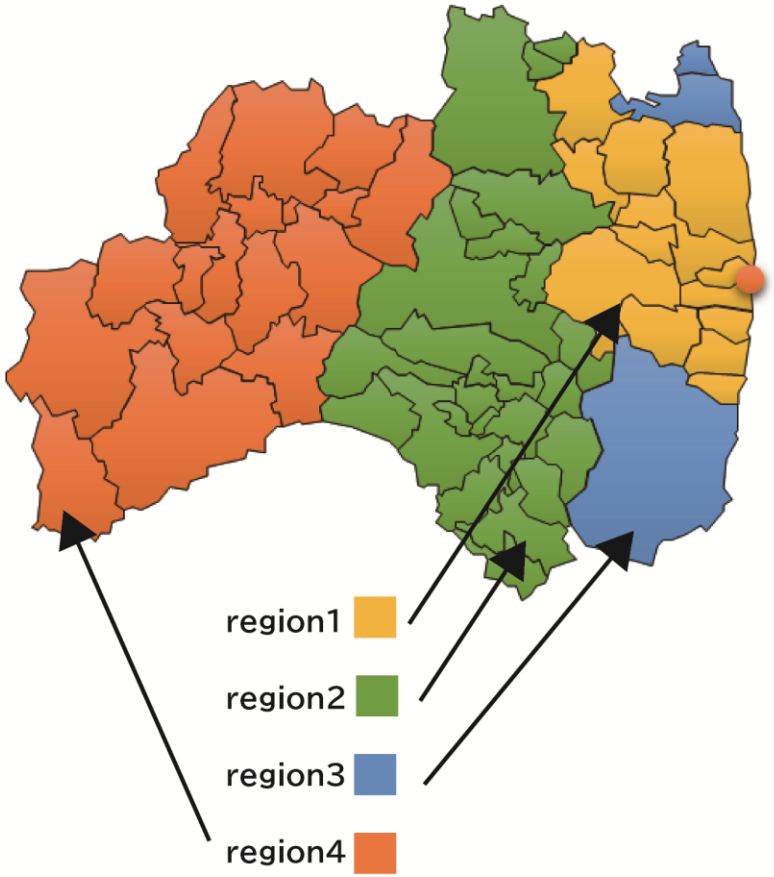
4th round survey



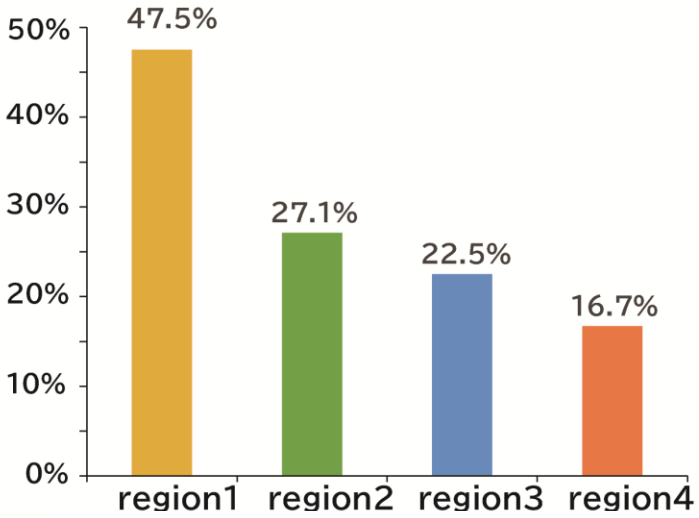
Document in the 20th Thyroid Examination Evaluation Subcommittee

FNAC implementation rate among examinees who were diagnosed as Grade B in the conf exam

Fukushima Prefecture



1st round survey



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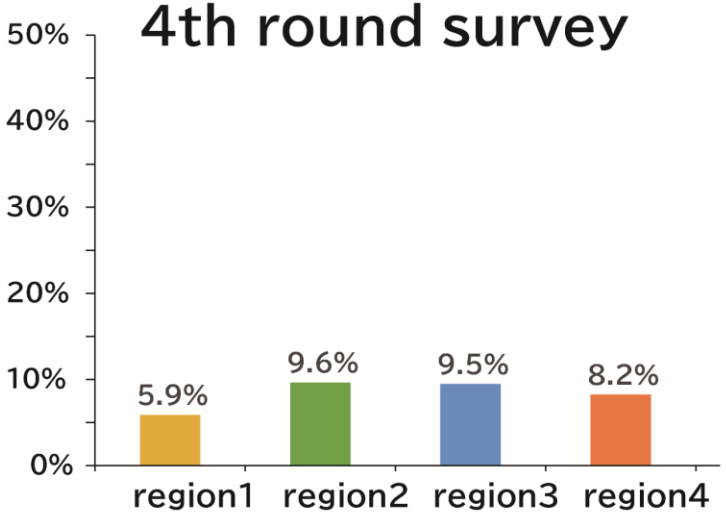
4th round survey



Document in the 20th Thyroid Examination Evaluation Subcommittee

counted as of September 30, 2023

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	Poorly differentiated carcinoma	1					
	Other variant		1				1
	Benign	1					

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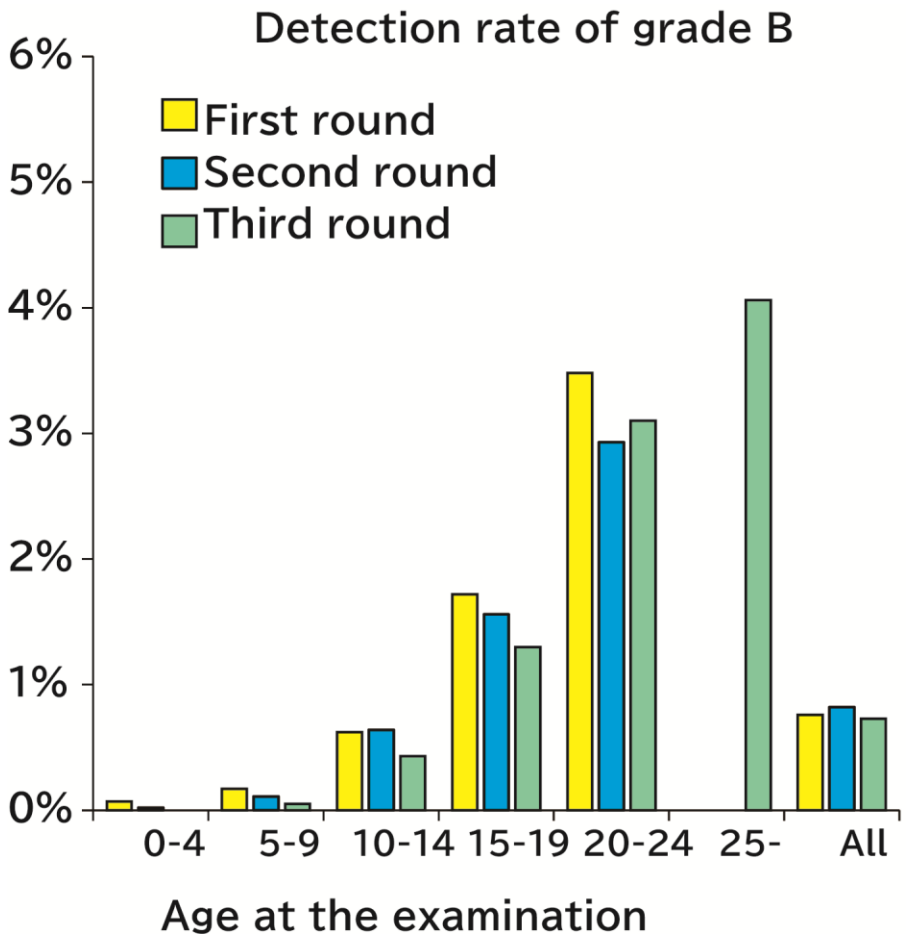
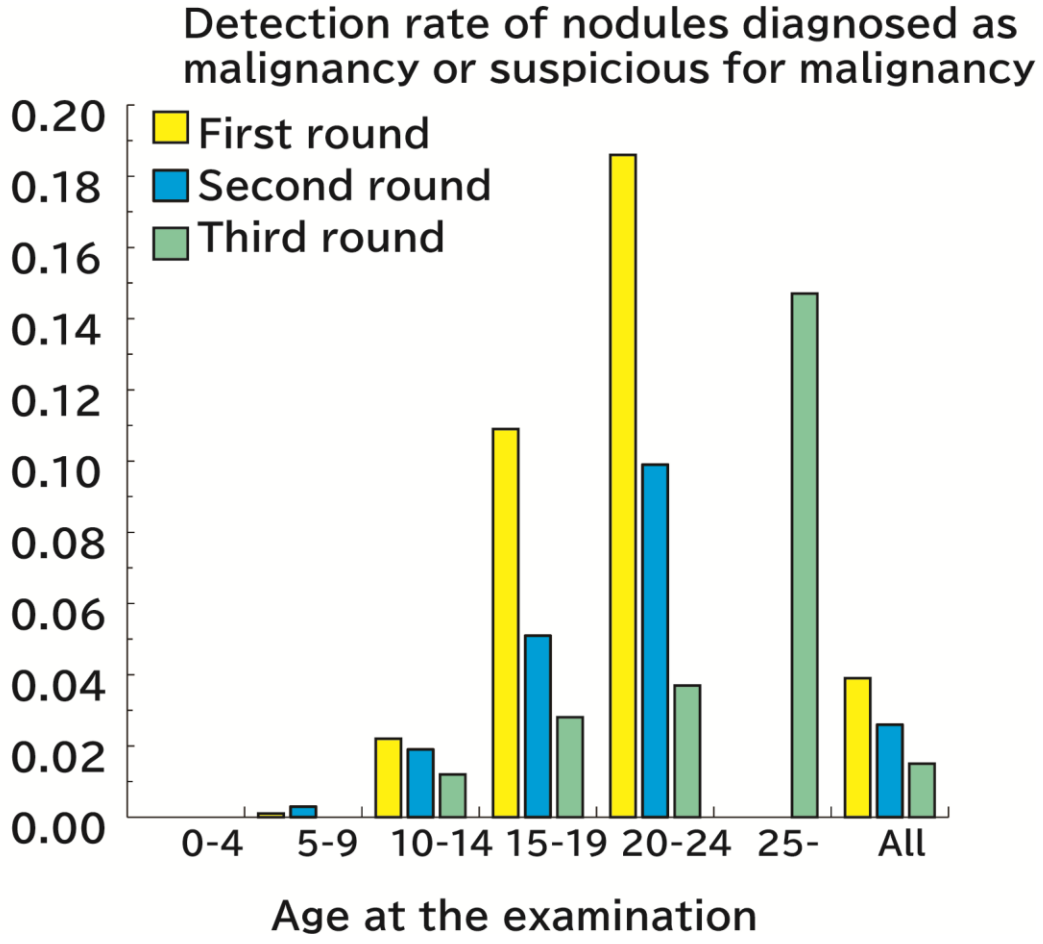
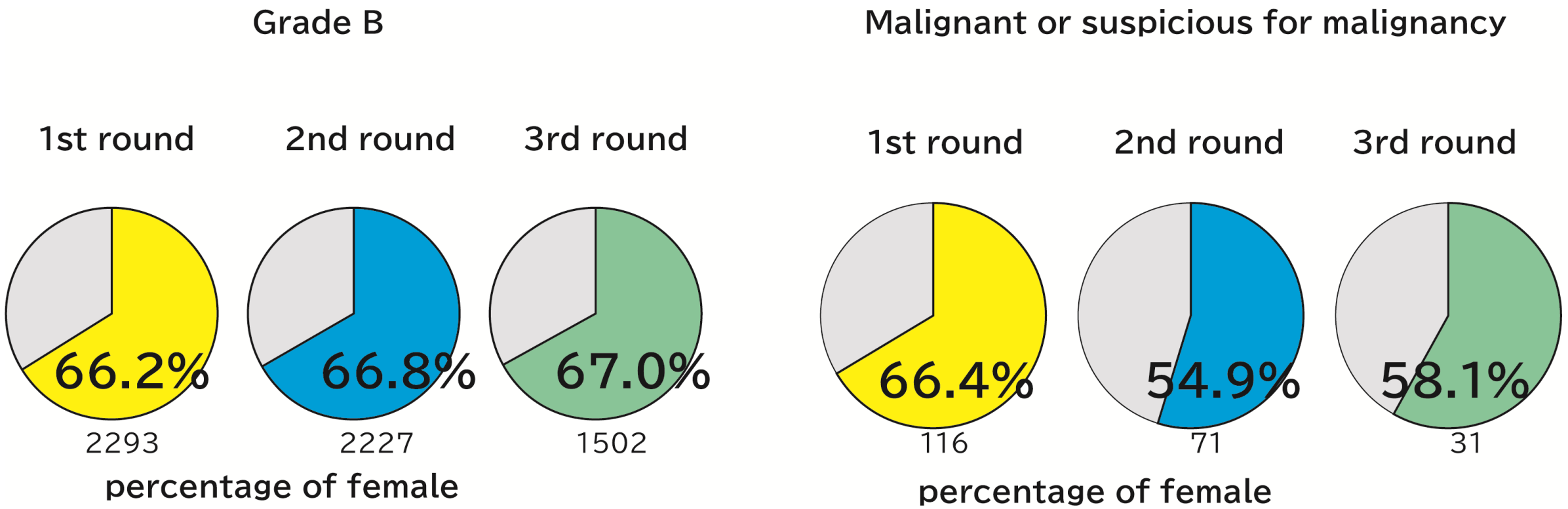
Detection rate of nodules diagnosed as malignant or suspicious for malignancy





Document in the 16th Thyroid Examination Evaluation Subcommittee

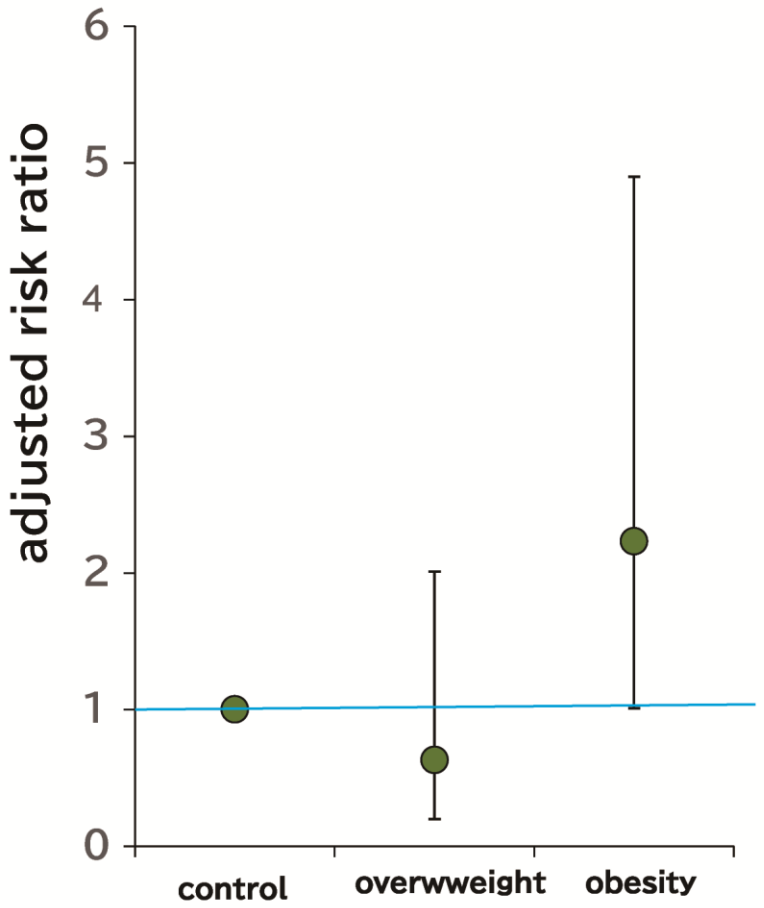
Association between gender and thyroid cancer



Document in the 27th, 31st, and 42nd, Prefectural Oversight Committee Meeting and the 16th Thyroid Examination Evaluation Subcommittee

Association between obesity and thyroid cancer

	control	overweight	obesity
Participants	200,202	22,395	14,633
Female (%)	50.9	44.5	42
Age at the accident	8.2	7.2	6.9
Age at the 2nd-roud exam	12.2	11.3	10.9
Percentage of Grade B	0.84	0.80	0.89
Participation rate of confirmatory exam (%)	81	87	82
Number of cases diagnosed with mallignancy or suspected mallignancy	56	3	7
Multivariable-adjusted Risk ratio ※	1	0.62 (0.20-2.01)	2.23 (1.01-4.90)



※ :Adjusted for age, sex, and location group by external radiation doses.

Ohira T. et al. Epidemiology 30: 853-860, 2019.

Conclusion

1. **The relationship between radiation exposure dose and Thyroid cancer.**

   There are no statistically significant dose-response relationship between radiation dose and the detection rate of thyroid cancer.

2. **Confounding factors associated with the thyroid cancer.**

   Regional differences in the participation rate of confirmatory examination, age, gender, and obesity might be confounding factors which affects to the detection rate of thyroid cancer.

Current Status and Future of the TUE

	survey category	implementation period	coverage
1st round	Preliminary baseline survey (aiming to check the baseline condition of participants' thyroid gland)	From October 2011 to March 2014	Residents of Fukushima prefecture aged 18 years and younger as of March 11, 2011
2nd round	Full-scale Survey (for comparison with the preliminary baseline survey)	From April 2014 to March 2016	Residents who were born between April 2, 1992 and April 1, 2012 Eligible participants are invited to receive thyroid ultrasound examination every two years through the age of 20, and then at five-year intervals after the age of 25.
～		～	
5th round		From April 2020 to March 2023	
6th round		From April 2023 to March 2025	

1. Development of environment of TUE

Public facilities (evenings and holidays)
Available for application via web and call center

Medical institutions (85 in-prefecture, 146 out-of-prefecture)*

Public facilities of TUE

* Counted as of December 31, 2023

2. Supporting activities

Psychosocial support

Doctors provide detailed explanations at public facilities of primary examination.

A support team offers psychosocial support to participants of the confirmatory examination to ease their worries and anxiety.

Medical consultation line

Doctors provide telephone consultations.

Interview by support team

On-site lectures and session

306 sites in total between 2013 and 2023 * * June 30, 2023

Medical expense support from Fukushima Prefecture

Support for the financial burden of medical expenses following a thyroid test

Acknowledgements

Fukushima medical university

Radiation Medical Science Center

Seiji Yasumura
Hitoshi Ohto
Tetsuya Ohira
Masanori Nagao
Fumikazu Hayashi
Hiroki Shimura
Satoru Suzuki
Susumu Yokoya
All Dept. of TUE staff

Radiation Medical Science Center

Department of Thyroid and Endocrinology

Satoshi Suzuki
Yoshiko Matsumoto
Koki Shio

Doctors and medical technologists cooperating with the TUE program

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