

Hand hygiene: a standardised tool for assessing compliance

Timothy L Brown¹ RN, Grad. Dip. Adv. Clin. Nurse (Psych) Grad. Cert. (Mental Health)

Laurelle J Burrell¹ RN, BAppSc Grad Cert (Clinical Trials)

Deidre Edmonds⁴ RN, CSIC

Rhea Martin⁴ RN, MPH

Jason O’Keeffe¹ RN, CSIC

Paul Johnson^{1,3} MBBS PhD FRACP MASM

M. Lindsay Grayson^{1,2,3} MBBS MD MSc FRACP FAFPHM

1. Infectious Diseases Department, Austin Health, Studley Rd, Heidelberg, Victoria, Australia, 3084.
2. Department of Epidemiology and Preventive Medicine, Monash University, Victoria, Australia
3. Department of Medicine, University of Melbourne, Melbourne, Victoria, Australia
4. Infection Control Department, Austin Health, Studley Rd, Heidelberg, Victoria, Australia, 3084.

Keywords: Hand Hygiene Compliance Tool (HHCT), Alcohol-Chlorhexidine Hand Rubs (ACHRS), Health Care Workers (HCWs), Methicillin Resistant *Staphylococcus Aureus* (MRSA), Centers for Disease Control and Prevention (CDC)

Abstract

A standardised tool for measuring hand hygiene compliance was developed as part of the Debug Infection Prevention Program at Austin Health in Melbourne, Australia. This standardised Hand Hygiene Compliance Tool (HHCT) was an integral part of the culture change program that encouraged the increased use of bedside alcohol-chlorhexidine hand rubs. This program was associated with a sustained improvement in hand hygiene among Health Care Workers and a reduction in the rate of Methicillin Resistant *Staphylococcus Aureus* (MRSA) infections¹. The details regarding the development of the HHCT and the methodology that needs to be addressed when using such a surveillance tool are presented.

Introduction:

For two hundred years, hand hygiene has been an integral part of infection control². During this period there have been a myriad of publications on the importance of hand hygiene amongst Health Care Workers (HCWs)^{3,4,5,6}. Hand hygiene is a general term used to describe the application of either a non-antimicrobial or antimicrobial soap/solution and water, or a waterless antimicrobial agent to the surface of the hands. In the last five years, there has been an emphasis placed on alcohol-chlorhexidine hand rubs (ACHRS) which have been designed to reduce the number of viable organisms on the hands, with maximum efficacy and minimum time⁷.

Previous studies have shown that improved hand hygiene can coincide with a reduction in hospital-acquired infection^{8,9,10,11}. To ensure optimal hand hygiene is performed by HCWs, a surveillance system is vital in assessing HCWs compliance with guidelines¹². The necessity of hand hygiene and glove usage by HCWs is defined in published guidelines by the Centres for Disease Control and Prevention (CDC)¹³. These guidelines specify the appropriate times when hand decontamination needs to be performed to reduce bacterial counts and therefore decrease the risk of cross infection.

It is recommended that glove use should occur when contact is anticipated with blood, body fluids, or other potentially infectious materials, mucous membranes, and non-intact skin. The CDC guidelines specify the following¹³:

- Remove gloves after caring for a patient;
- Perform hand hygiene after removal of gloves;
- Do not wear the same gloves for the care of more than one patient;
- Do not wash gloves between patients; and
- Change gloves during patient care, if moving from a contaminated body site to a clean site.

The CDC guidelines specify that hand hygiene should occur with any patient contact and HCWs hands should be washed with a non-antimicrobial soap and water or, an antimicrobial soap and water when hands are visibly soiled or contaminated. If hands are not visibly soiled, HCWs can use an alcohol-based hand rub for routinely decontaminating hands in clinical situations as described in the literature¹⁴:

- Before having direct contact with patients;
- Before donning sterile gloves when inserting a central intravascular catheter;

- Before inserting indwelling urinary catheters, peripheral venous catheters, or other invasive devices that do not require a surgical procedure;
- After contact with a patient (such as in taking a pulse or blood pressure, or lifting a patient);
- After contact with body fluids or excretions, mucous membranes, non-intact skin, or wound dressings;
- If moving from a contaminated-body site to a clean-body site during patient care;
- After contact with inanimate objects (including medical equipment) in the immediate vicinity of the patient. This includes bedside chart;
- After removing gloves.

HCWs compliance with the above guidelines is an essential component in the prevention of cross transmission of bacteria. To ensure staff understanding of compliance, surveillance should be undertaken on a regular basis. Whilst direct observation is currently the 'gold standard' and the most reliable method for assessing adherence rates, it is also the most time consuming. Conversely, less time consuming and indirect methods can be used, such as monitoring usage figures (litres/per patient bed days) or monitoring of infection rates (episodes per patient bed days)¹⁷. However, these do not determine which HCWs are using the products or whether hand hygiene practices have been performed correctly. An HHCT provides the means to accurately assess activities and behaviours that precede and follow hand hygiene opportunities. Observations should be structured within a ward area for a fixed time and this needs to be before or after introduction of ACHRS (or in routine surveillance), as this provides consistency and compatibility of data sets.

Austin Health developed an HHCT in conjunction with the Debug Infection Prevention Program (www.DeBug.net.au) and was developed in accordance with the CDC guidelines¹³. The HHCT was also used in routine surveillance to determine whether improved hand hygiene practices were sustained. This article provides guidance on the types of hand hygiene activities that can be collected and discusses the methodology associated with such a surveillance tool.

Hand hygiene compliance tool

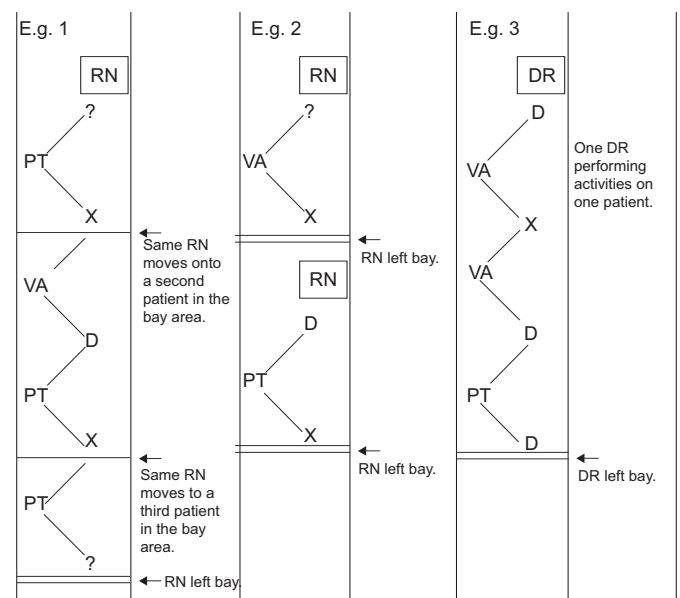
The HHCT described below records the type of HCW being observed, documents the hand hygiene product and glove use, and provides a coding system that categorises HCWs performed activities (refer to Table 1 and Table 2). There are differences in the coding classifications for routine bay areas and intensive care units (ICU), due to the different types of activities performed in these clinical settings (refer to Table 1).

On the recording observation sheet, HCW type, hand hygiene opportunities and glove use should be recorded on the right hand side of each column, and the type of activities performed by the HCW are recorded on the left hand side of each column as shown in Figure 1. The classification coding system provides a detailed description of the HCWs designation and whether the HCW performed hand hygiene (refer to Table 1 and Table 2).

As shown in Figure 1 when a HCW is providing care for a patient and then moves to a new patient, the activities performed with the first patient are separated from the next patient by a single line. This indicates that the same HCW provided care for more than one patient. When a HCW is providing care for a patient and then leaves the room (without touching a second patient), two lines are drawn under the hand hygiene opportunity and this completes the HCW observation.

Hand hygiene observations

Observations of hand hygiene behaviour should be location-based, performed by trained field workers, and governed by a structured time frame. It is also important to select bay areas that have a convenient location from which to observe patient beds and hand washing facilities. For routine wards (non-ICU) to be selected for observation, it is recommended that patient bays



E.g. 1 Registered Nurse (RN) walks into the bay area and the field observer is unsure of hand hygiene (HH) performed by the RN (?) and the RN touches the patient's skin (PT) and fails to perform HH (X). The same RN moves to a second patient in the bay area and has contact with the patient's intravenous circuit (VA), then performs HH with an alcohol-chlorhexidine hand rub (D), then the RN touches the patient's bed (PT) but fails to perform HH (X). The same RN moves onto a third patient and the RN touches the bed linen (PT) and the last HH activity performed by the RN was not sighted by the field observer (?) and the RN walks-out of the bay area.

Figure 1: Recording Health Care Workers moving from one patient to another and leaving a bay (for coding of activities refer to Table 1 and Table 2).

Table 1: Definitions and codes used in assessing hand hygiene compliance.

Site of HH assessment	Code	Definition
Routine wards:	VA	A break to a sterile intravenous (IV) circuit, contact with a sterile IV site, or IV dressing change. For example, venous access, arterial line access, peripheral IV access, preparation and administration of IV medication. Other sterile circuits to include: intracranial pressure, haemo-filtration.
	NE	Needles. For example, subcutaneous injections, intramuscular injections, arterial blood gases, venipuncture, blood glucose levels.
	DC	A break to a closed (potentially sterile) drainage circuit. For example, intercostal catheters, suprapubic catheters, urinary catheters (& bag), or drainage bags. Contact with a drainage insertion site or dressing. For example, intercostal catheters, suprapubic catheters.
	WC	Contact with patient's non-intact skin, or wound care/dressings and materials contaminated with secretions or excretions from wound sites.
	TC	Assisting with toileting, bowel care, or PR medication. For example, contact with urine or faeces or materials potentially contaminated with urine or faeces, including removal and emptying a urinary bottle or bedpan.
	RC	Respiratory care. For example, direct or indirect contact with sputum, mucous membranes, suctioning, tracheostomy care, oral intubation.
	PT	Contact with a patient's intact skin. For example, taking a blood pressure, temperature, or pulse, assisting with hygiene, mobility assistance. Direct patient contact. For example, administration of oral medication, nebulisers, oxygen therapy, and nasogastric care. Objects/equipment that is directly contiguous with the patient. For example, oxygen tubes and masks, patient clothing, the bed, bed attachments, bed linen, over bed table, call bell, bedside chair, lifting machine and shower trolley, ONLY if the patient is present (otherwise recorded as "IA").
Intensive Care Units (ICU)- High Dependency Unit (HDU)	IA	Inanimate objects including medical equipment in the patient zone. For example bedside charts, pumps and devices, lines, monitors and machines. Cutlery and crockery are NOT recorded. When the patient is NOT present, oxygen tubes and masks, patient clothing, the bed, bed attachments, bed linen, over bed table, call bell, bedside chair, lifting machine and shower trolley (if patient is present, these items are recorded as PT activity).
	MP	Medication preparation for IV, subcutaneous, intramuscular medication.
	RC	Respiratory care. For example, direct or indirect contact with sputum, mucous membranes, tracheostomy intubation and suctioning, oral intubation and suctioning.
	NG	Nasogastric care (aspiration or feeding).
	CH	Patient chart including chart table
	HF	Record break to the sterile haemo-filtration
	SC	Endotracheal suction via ETT to tracheostomy

Table 2: Definitions and codes used in assessing hand hygiene compliance.

All Ward Areas	Code	Definition
Type of Health Care Worker	RN	Nurse
	DR	Doctor
	PSA	Patient service attendant and cleaners
	AH	Allied Health Care Workers
	PH	Physiotherapist (recorded separately from AH in ICU only)
	BL	Blood collecting staff-Phlebotomists
	ST-	Whether the HCW is a student (eg ST-RN, ST-AH, ST-PH)
	O	All other types of HCWs (eg ward clerks, pastoral carers, food services)
Hand Hygiene Product	W	Water only
	S	Non-medicated soap (eg skin care cleanser)
	C	Chlorhexidine based soap (2%, 4%)
	T	Triclosan based soap (eg PhisoHex – usually noted in ICU only)
	B	Providone-Iodine based solution (usually noted in ICU only)
	R	Existing alcohol hand rub (old product, eg Hexol)
	D	New Alcohol-chlorhexidine based hand rub introduced (eg DeBug™)
	X	Opportunity for hand hygiene noted, but failed to perform
?	Unsure or unknown (cannot accurately record a “yes” or “no”)	
Glove Use	G	Gloves on
	G	Gloves off
	ST-G	Sterile gloves on
	ST-G	Sterile gloves off

have two or more patient beds; this provides a greater chance of observing hand hygiene practices. The ICU settings are different as HCWs provide care to one patient in a selected bay area (one bay, one patient), or this area may also include a high dependency unit (a bay may include more than one patient bed) and both bay areas should be observed. Once patient bay areas have been established as suitable for observing hand hygiene practices, a randomised allocation schedule should be developed to ensure that all bay areas are observed equally¹⁶.

Based on previous experience, it takes less time to observe hand hygiene opportunities in routine wards when compared to the ICU setting. The rationale for the difference in the number of hand hygiene observations in these different clinical settings is that there are more opportunities for HCWs to wash their hand in ICU^{9,17,18}. Hence the data collection sheets are different for both routine wards and intensive care wards (refer to Table 1 and Table 2).

The best time to carry out hand hygiene observations is primarily dependent upon the busy periods of the day and it is important to spread the observation sessions over a 5-10 day period, since day-to-day variation may occur. Observation sessions conducted over a number of days are more likely to be representative of HCWs true hand hygiene behaviour.

It is quite normal for HCWs to react to the presence of an observer or to behave differently. The initial hand hygiene compliance data collected is likely to be positively skewed towards higher rates of compliance than during non-observation periods. This phenomenon is called ‘reactivity’¹⁵. As HCWs know they are being observed, they tend to try to behave according to their understanding of best hand hygiene practice. Conducting ‘mock’ sessions the week before commencing ‘real’ observations, may provide time for HCWs to feel at ease and start acting as if the observer is not present.

Data collection

Based on previous research, our observation sessions lasted 20 minutes¹⁷ and were undertaken according to the allocation schedule during either a morning or afternoon shift. The target number of sessions should be between 9-15 per day (3-5 hours) during observational surveillance; taking into account the average number of hand hygiene opportunities per hour⁹, the number of field observers available, and the number of days nominated for data collection.

A recording observation sheet should be used that provides a record of the ward, assessment number, session number, randomised bay number, observer name, date and time (an observation sheet is available from www.DeBug.net.au). By

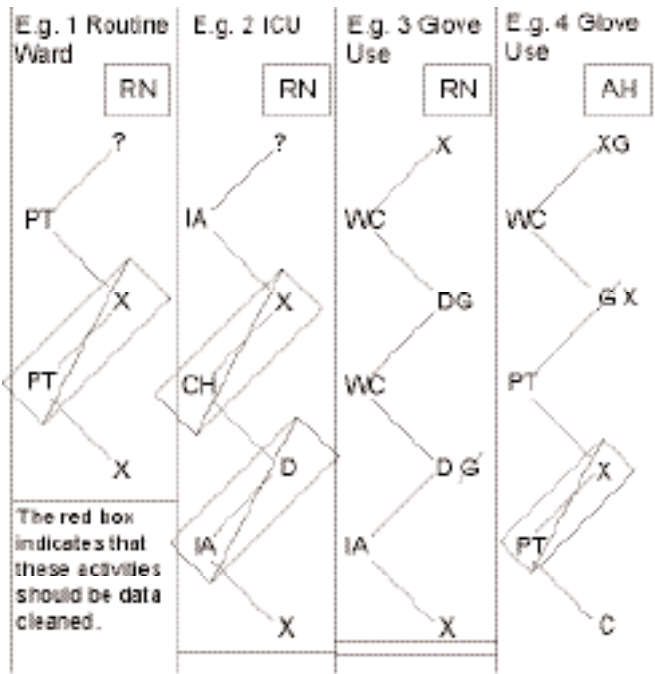


Figure 2: Data cleaning with Health Care Worker (for coding of activities refer to Table 1 and Table 2).

using the allocation schedule, the field observers are directed to certain bay areas to commence observation sessions and field observers need to check that:

- At least one patient is present in the bay – if not, move to the next bay in a clock-wise direction.
- In post-intervention assessment periods, it is important to check that the culture change intervention has been implemented or is available.

It is vital that the field observers position themselves where they can both view the patient beds and sink areas. It is recommended that field observers should view activities performed behind closed curtains when appropriate (the observed HCW and patient). If hand hygiene activities cannot be clearly observed then should not be recorded.

The number of HCWs observed at one time depends on the level of activity and ability of recorder. More than one HCW can be observed at the same time, provided hand hygiene opportunities can be accurately observed and recorded for each HCW. If not, additional HCWs should not be observed until the HCWs under observation have left the bay. As a general rule, it is better to record less, more accurate data, than more data that includes many queries (hand hygiene performance not sighted as indicated by a question mark).

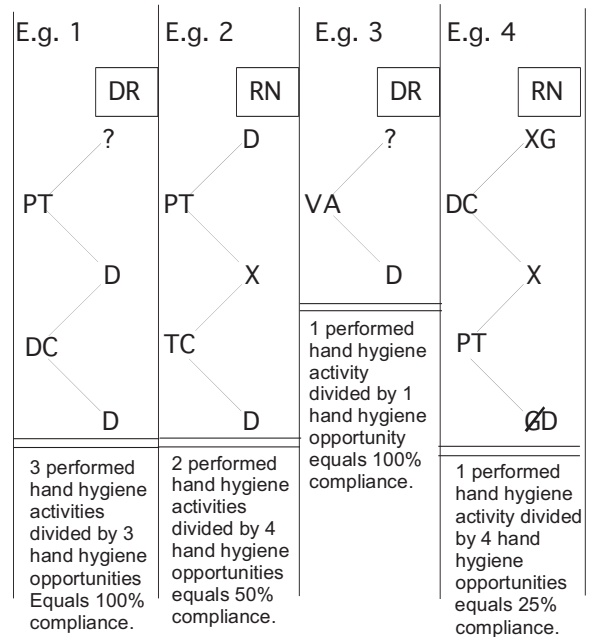


Figure 3: Calculating hand hygiene compliance (for coding of activities refer to Table 1 and Table 2).

If no activity occurs during a two-minute period, field observers may proceed to the next bay in a clock-wise direction for the duration of the 20-minute observation period¹⁷. Once this observation period is complete, field observers should then be directed by the allocation schedule to next observation bay area. Reasons for no activity may include:

- No HCW entering the room during two minutes of observation.
- HCWs activities were performed behind closed curtains for two minutes (excluding ICU) and the HCW or patient objected to being observed directly, or it was not appropriate.
- No patients in the bay area.

Hand hygiene data analysis

Data cleaning should occur to ensure false positives are not generated. For example, the same activity performed consecutively on the same patient. When the same activity is recorded twice, one after the other, the subsequent activity should be removed. For example, the boxed sections below should be highlighted and removed in the hand hygiene sum of opportunities as shown in Figure 2, example 1.

It is important to note that hand hygiene is only counted after (not before) contact with inanimate objects and this includes any contact between the patient charts and inanimate contacts in ICU.

These examples are in accordance to the CDC guidelines^{13,14}. For example, the boxed sections below should be highlighted and removed in the hand hygiene sum of opportunities as shown in Figure 2, example 2.

The exception to this rule applies when gloves are used, changed or removed. When the same activity is recorded twice, one after the other, the subsequent activity should remain if gloves were applied, changed or removed between the activities. For example, the boxed sections below should be highlighted and removed in the hand hygiene sum of opportunities as shown in Figure 2, example 3 and 4.

A statistical data package like Access (Windows, 2000) can be used to enter and analyse the hand hygiene compliance data, conversely manual calculations of hand hygiene compliance is possible. By using the recording observation sheets, within a string of activities performed by the HCW, each hand hygiene opportunity is counted twice, once before the activity and the second time after the activity. Hand hygiene compliance is calculated using the following equation; the total number of hand hygiene opportunities correctly performed (numerator) divided by the total number of hand hygiene opportunities observed (denominator) during a given time period as shown in Figure 3.

Conclusion

Austin Health HHCT provides the means to record hand hygiene behaviour of HCWs by calculating observed hand hygiene opportunities. This HHCT was part of the culture change program that encouraged the increased use of bedside ACHRS. This program was associated with a sustained improvement in hand hygiene among HCWs and a reduction in the rate of Methicillin Resistant *Staphylococcus Aureus* (MRSA) infections¹. The relevant nursing staff should be trained to accurately record hand hygiene opportunities and these 'field observers' should be responsible for conducting hand hygiene surveillance and calculating hand hygiene compliance rates. It is important to audit these field observers for inter-reliability as this will ensure accuracy and consistency of the hand hygiene observations. Finally, undertaking of a culture change program must include rapid feedback of hand hygiene compliance rates^{17,19} and promotional activities¹⁷ that aim to educate every HCW about hand hygiene; as suboptimal hand hygiene occurs amongst all groups of HCWs. Every HCW can become a positive role model in hand hygiene practices.

Acknowledgments

The HHCT was developed with the assistance of a quality improvement grant from the Department of Human Services.

Thanks to Mr Chris Bolger for assistance with hand hygiene compliance assessments and Mrs Sandi Gamon who provided guidance to the preparation of this article.

References:

1. Johnson PDR, Mayall BC, Grabsch EA, Burrell LJ, Bolger C, Martin R, *et al.* Controlling hyperendemic nosocomial MRSA in an Australian teaching hospital. (Abstract K-1858) 44th Interscience Conference on Antimicrobial Agents and Chemotherapy, Washington, DC. November, 2004.
2. Pittet D & Boyce JM. Hand hygiene and patient care: pursuing the Semmelweis legacy. *The Lancet Infectious Diseases* 2001; April: 9-20.
3. Larson E & Kretzer EK. Compliance with hand washing and barrier precautions. *Journal of Hospital Infection* 1995; 30: 88-106.
4. Rotter ML. Hand washing and hand disinfection (chapter 87) in; Mayall CG, ed. *Hospital Epidemiology and Infection* (2nd edition). Philadelphia: Lippincott Williams & Wilkins, 1999: 1339-1355.
5. Pittet D. Improving compliance with hand hygiene in hospitals. *Infection Control and Hospital Epidemiology* 2000; 21 (6): 381-386.
6. Pittet D. Improving adherence to hand hygiene practice: a multidisciplinary approach. *Emerging Infectious Diseases* 2001; 7(2): 234-240.
7. Trampuz A & Widmer AF. Hand hygiene: a frequently missed lifesaving opportunity during patient care. *Mayo Clin Proc* 2004; 79: 109-116
8. Larson EL, Early E, Cloonan P, Sugrue S & Parides M. An organisational climate intervention associated with increased hand washing and decreased nosocomial infections. *Behavioural Medicine* 2000; 26 (1): 14-22.
9. Pittet D. Compliance with hand disinfection and its impact on hospital-acquired infections. *Journal of Hospital Infection* 2001; 48 (Supplement A): s40-s46.
10. Aiello AE & Larson EL. What is the evidence for a casual link between hygiene and infections. *The Lancet* 2002; 2:103-110.
11. Silvestri L, Petros AJ, Sarginson RE, de la Cal MA, Murray AE & van Saene HKF. Hand washing in the intensive care unit: a big measure with modest effects. *Journal of Hospital Infection* 2005; 59: 172-179.
12. Pittet D. Hand hygiene: improved standards and practise for hospital care. *Curr Opin Infect Dis* 2003; 16: 327-335.
13. Centre for Disease Control and Prevention. 'Guideline for Hand Hygiene in health-care settings: Recommendations of the Healthcare Infection Control Practices Advisory Committee and the HICPAC/SHEA/APIC/IDSA Hand Hygiene Task Force', Morbidity and Mortality Weekly Report, 2002; 51 (No. RR-16). <http://www.cdc.gov/handhygiene/>
14. Pittet D & Boyce JM. Revolutionising hand hygiene in health-care settings: guidelines revisited. *Lancet Infect Dis* 2003; 3:269-70.
15. Bentley M, Boot M, Gittelsohn J, Stallings R. The use of structured observations in the study of health behaviour. IRC International Water and Sanitation Centre. The Hague, Netherlands & London School of Hygiene and Tropical Medicine, London, United Kingdom. Occasional Paper 27, 1994.
16. Research randomiser: <http://www.randomizer.org/about.htm>
17. Pittet D, Hugonnet S, Harbarth S, Mourouga P, Sauvan V, Touveneau S, Perneger TV. Effectiveness of a hospital-wide programme to improve compliance with hand hygiene. *Lancet* 2000; 356:1307-12.
18. Tvedt C & Bukholm. Alcohol-based hand disinfection: a more robust hand hygiene method in an intensive care unit. *Journal of Infection Control* 2005, 59: 229-234.
19. van del Mortel & Heyman L. Performance feedback increases the incidence of hand washing by staff following patient contact in intensive care. *Australian Critical Care* 1995; 2: 8-13.