ANTT® standardisation facilitates new efficiencies with a novel partially-sterile Standard-ANTT PIVC Pack

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ABSTRACT

Introduction: The widespread adoption of the *ANTT®Clinical Practice Framework* as a single standard for aseptic technique, has highlighted that many clinical procedures do not require a sterile procedure pack to be performed safely and aseptically. This study explores the utilisation of a partially-sterile procedure pack that is specifically tailored to Standard-ANTT. Methods: A prospective project improvement evaluation, using a non-paired sample (pre: *n*=41; post: *n*=33) of emergency department staff in an NHS hospital. Staff were evaluated performing peripheral intravenous cannulations (PIVC) using Standard-ANTT and the B. Braun Standard-ANTT peripheral cannulation pack. Findings: Significant improvements were observed in practice following the implementation of the pack and training in Standard-ANTT, including: Key-Part protection significantly improved (pre: *n*=28, 68.2%; post: *n*=33, 100%), and reduction in the Key-Site being touched after disinfection (pre: *n*=17; 41.4%; post *n*=5; 15.1%). Conclusions: In conjunction with appropriate education and training, this study provides proof of concept that due to the widespread use of the *ANTT Clinical Practice Framework* as a single standard aseptic technique, procedure packs that are specifically tailored to Standard-ANTT, can help to promote best practice and improve efficiencies.

Key words: Aseptic Non Touch Technique (ANTT®) ■ Standard-ANTT ■ PIVC ■ Cannulation ■ Procedure Packs

Definitions:

Partially-sterile procedure pack – all items required to be sterile remain in their individual blister wrapper. The final assembled pack itself is not then subjected to a further round of sterilisation as it is not needed.

Sterile procedure pack – often contains a mixture of non-sterile and sterile items that have been stripped from their individual blister wrapper requiring the sterilisation of the final assembled pack.

Peripheral cannulation involves a significant risk of infection (Bitmead, 2018; Guerrero, 2019; Buetti et al, 2022). This paper outlines the development of a novel type of clinical procedure pack specifically tailored to support best practice in peripheral cannulation while using the most common type of aseptic technique performed in the UK daily, Standard-ANTT®.

It is already well established that clinical procedure packs that ensure all items needed for a specific procedure are in one place can help improve aseptic technique through addressing human factors and supporting standardisation of practice (Ray-Barruel et al, 2019).

However, the Association for Safe Aseptic Practice (ASAP), a non-profit NGO which oversees the development and dissemination of Aseptic Non Touch Technique (ANTT) internationally, has shown that using sterile procedure packs can be wasteful and sometimes lead to suboptimal aseptic technique. For example, it is normal for practitioners to have access only to sterile packs to perform even simple wound-care procedures. Not only is this wasteful of resources and costs but also it means the type of aseptic technique used can be dictated by the procedure pack, potentially resulting in overly complicated or confused hybrid practice (Poole and Coughlan, 2002).

The working hypothesis of this product development project was that widespread adoption of the *ANTT Clinical Practice Framework* (Rowley and Clare, 2020) as a single standard aseptic technique and universal practice language would provide significant advantages for clinical practice.

For example, and in focus here, is how the now common use of Standard-ANTT better enables manufacturers to produce more tailored partially-sterile clinical procedure packs for technically simple aseptic procedures.

In short, there are benefits to having all the procedure equipment (as recommended by best practice) available consistently in the same place, without having to manage the procedure with a Surgical-ANTT approach and the potential for having to resterilise already sterilised equipment.

Project inception

ANTT is a free-to-use practice framework for aseptic technique (National Clinical Guideline Centre, 2012). B. Braun observed

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health care workers increasingly using ANTT in clinical practice, and listened to requests for medical supplies to better reflect and support this developing single-standard approach.

B. Braun approached the Association for Safe Aseptic Practice (ASAP), and asked to collaborate to develop a dedicated peripheral cannulation pack to support Standard-ANTT. ASAP and ANTT have no financial interest in product sales.

Procedure packs

A typical wound-care pack is sterilised, which is necessary for complex wounds. However, many wounds are small and technically simple to manage aseptically and, consequently, much of the pack contents are often wasted, incurring significant expense. Similarly, peripheral cannulation packs are usually sterilised, yet many, if not most, cannulations are performed using Standard-ANTT.

Basic sterile procedure packs, intended to provide general items required for multiple procedures, often do not contain all equipment required for any one procedure and additional items may be required. These items incur cost, take time to collect, can be omitted in error by busy practitioners or may not even be available.

Re-sterilising items that are already sterile, such as a wound dressing or cannulae, when sterilising assembled procedure packs can be more damaging environmentally. Some manufacturers have to transport product to and from a sterilisation facility, further increasing a product's carbon footprint.

Standardising clinical practice with ANTT

For decades and still the case today, ambiguous and variable aseptic practice language has contributed to health care workers having a poor understanding of the process, actions and goal of aseptic practice (Rowley et al, 2010; Rowley and Clare, 2020). A lack of a standard approach, education, training and assessment has led to practitioners applying a variety of interpretations of aseptic technique to different procedures. This has resulted in considerable unwanted variation in practice for decades (Thomlinson, 1987; Johnson, 1988; Bree-Williams and Waterman, 1996; Gilmour, 2000; Preston, 2005; Flores, 2008; Aziz, 2009; Rowley et al, 2010). Ambiguity in both language and practice, has contributed to suboptimal clinical practice, inefficiencies and, again under focus here, excessive use of sterilised equipment.

ANTT has significantly addressed the ambiguities and confusion that inhibit aseptic technique education, practice and research. After many years of development and widespread adoption, the single standard approach to aseptic technique with ANTT and universal practice language have promoted safer and more efficient clinical practice (Rowley and Clare, 2020).

The language of ANTT attempts to be both concise and accurate; once learned, ANTT principles and simple descriptors convey meaning to practitioners and patients alike. ANTT is used widely around the world and was identified as the single standard aseptic technique in 82% of all NHS trusts in England (Rowley and Clare, 2020). With a single, standard approach to aseptic technique now in place with ANTT, manufacturers are beginning to recognise opportunities to produce more tailored procedure packs that better reflect the two types of ANTT approach.

By providing two defined approaches to aseptic technique, ANTT provides a clinical practice framework that is efficient. Each approach uses the same concept of Key-Part and Key-Site Protection to achieve a common aim of asepsis, but using different levels of sterile supplies.

In Surgical-ANTT, used for technically complex procedures, Key-Parts are managed collectively on a large Critical Aseptic Field (a sterile drape) and more sterilised supplies and sterile gloves are required.

Significantly, in Standard-ANTT, Key-Parts are protected individually. Being able to safely manage and handle the most important parts of the procedure equipment—the Key-Parts—by a combination of non-touch technique and small, Micro-Critical Aseptic Fields (eg sterile syringe caps) is flexible, can be applied in all practice settings, is cost effective and is efficient, taking less time.

Realistic aim of aseptic technique

Traditionally, clinical practice has been confused by the often interchangeable practice terms of aseptic and sterile technique.

To promote understanding, ANTT is based on accurate terms for states that can be achieved in practice. It explicitly distinguishes between aseptic and sterile states. Sterile concerns the complete absence of all microorganisms; a truly sterile state is unachievable in typical healthcare settings because of the interaction of equipment with the air environment. The state of asepsis, on the other hand, requires the absence of pathogenic microorganisms in a sufficient dose to cause infection. This can be a reality in clinical practice and is entirely more practical, as it can be readily achieved in all healthcare settings (ASAP, 2022).

As an example, sterilised equipment and medical devices are truly sterile only when in unopened packaging. Once packaging has been opened, equipment is immediately vulnerable to inadvertent touch and airborne contamination. The logical fallacy that a sterile technique can be achieved in any setting simply by using sterilised equipment, sterilised packs and sterile gloves, can create a false impression of security for many healthcare workers (Clare and Rowley, 2018).

Although in theory an aseptic state is a lesser standard than a sterile state, by definition, it is the only achievable state in clinical practice, but confusion has arisen over an inaccurate, sterile-centric terminology. The inside of recently opened equipment packaging is functionally the same as an opened sterilised drape; both were sterile, both are aseptic after opening and both have inherent properties that readily protect Key-Parts—a Critical Aseptic Field (the sterilised drape) protects the Key-Parts collectively, and a Micro Critical Aseptic Field (the inside of sterilised packets) protects Key-Parts individually.

Aseptic fields

In terms of procedure pack design and use, a clear understanding of the role and management of aseptic fields is essential to design and application of safe aseptic technique. However, ambiguity in generic and variable terminology of aseptic technique can be an area of concern regarding aseptic fields.

Figure 1. The large sticker on the front of the procedure pack identifies the drape that contains the procedure equipment as 'non-sterile' and, crucially, as a General Aseptic Field

Addressing this, the *ANTT Clinical Practice Framework* (Rowley et al 2010) rationalised the three types of aseptic field and defined their very different handling and management. Practitioners need to understand this for aseptic practice to be effective.

General Aseptic Field

Typically, a procedure tray or work surface *promotes* asepsis by providing basic protection for procedure equipment from the procedure environment. General Aseptic Fields are non-sterilised and are used when the procedure Key-Parts are easily and primarily protected individually by Micro Critical Aseptic Fields and non-touch technique.

Critical Aseptic Field

A sterilised drape *ensures* asepsis by protecting Key-Parts collectively from the procedure environment.

Micro Critical Aseptic Fields

Sterile caps, covers and the inside of recently opened sterile packaging are all types of small aseptic fields. They are used to protect equipment Key-Parts individually when using a General Aseptic Field.

Standard-ANTT

When using Standard-ANTT, practitioners will place procedure equipment in a General Aseptic Field to promote asepsis while ensuring asepsis with a combination of Micro Critical Aseptic Fields and a non-touch technique. Although this is considered a far simpler technique than Surgical-ANTT, it provides robust, effective and consistent aseptic protection for procedure Key-Parts.

Surgical-ANTT

This approach requires a Critical Aseptic Field; only sterilised equipment can be opened then added to the Critical Aseptic Field. These items immediately become aseptic. Sterile gloves must be used to ensure a non-touch technique. The procedure Key-Parts are protected collectively on one large Critical Aseptic Field to ensure they are aseptic.

This approach is more complicated and time consuming than Standard-ANTT. In addition, the much larger procedure areas associated with Critical Aseptic Fields (the sterilised drapes) are difficult to maintain effectively, especially in relatively uncontrolled environments such as inpatient wards and small outpatient spaces.

The practitioner has to maintain the aseptic state of a much larger area than required for Standard-ANTT, with more precisely choreographed handling of equipment (Clare and Rowley, 2018; Rowley and Clare, 2020).

Standard-ANTT cannulation procedure pack

Having all the equipment needed for a procedure compiled in one procedure pack is not new (Lee, 2015); however, tailoring a partially-sterile procedure pack to more effectively and sustainably support a Standard-ANTT approach is novel. It should be highlighted that within a partially-sterile procedure pack all items required to be sterile, are. The term partially-sterile indicates that the outer procedure pack wrap itself has not been sterilised.

B. Braun's Standard-ANTT cannulation pack collects together individually sterilised components (as they would present on their own) in a non-sterile pack wrap. It contains: a Caresite positive displacement needle-free extension set (in a sterile packet); an Omniflush pre-filled syringe (fluid contents sterile, protected with a sterilised cap); a ChloraPrep 1 ml skin applicator (in sterile packet); a Tegaderm IV transparent film dressing with border (in a sterile packet); a single-use, disposable tourniquet (non-sterile); a waterproof patient underarm drape (non-sterile); a pack of gauze (in a sterile pack); and a General Aseptic Field (a non-sterile drape).

B. Braun has recognised the importance of supporting such a pack with clear guidance and education and has taken an original approach. Each box of procedure packs comes with a printed procedure guideline ready to display in clinical areas. In addition, a QR code on the packaging enables practitioners to be able to connect instantly to a short demonstrational video by a mobile electronic device. This approach significantly raises the bar for product instruction. It should be noted that some NHS organisations do not allow or promote the use of personal mobile devices, such as smartphones, in clinical workspaces.

There is a large instructional sticker plainly visible through the clear window of the procedure pack. This sticker identifies the drape that contains the procedure equipment as 'non-sterile' and, crucially, as a General Aseptic Field. The sticker also instructs how the intended procedure should be managed with Standard-ANTT, and how Key-Parts should be protected (*Figure 1*). Again, this is a new level of product instruction and a significant improvement on a generic instruction sheet.

Methods

This prospective interventional study introduces a novel partially-sterile procedure pack in line with the *ANTT Practice*

Framework. The pack contains all the items needed to perform a safe and effective IV cannulation using a Standard-ANTT approach (see The Pack section). The contents of the pack are in line with best practice-recommendations (Loveday et al, 2014; Gorski, 2021) and current expert opinion (Barton et al, 2022).

The Clinical Therapy Specialist team who delivered the education and audit received their training in ANTT from experienced ANTT educators from ASAP. Staff were then audited before the introduction of the procedure pack and training intervention, using the B. Braun Peripheral Performance Programme audit tool, and again afterwards. The standardised observation tool used, developed by B. Braun's Clinical Therapy Specialist team in conjunction with ASAP, consists of a multiple-category checklist to evaluate both equipment and practice.

Sample and location

This was a single intervention in a single site, using a non-paired convenience sample (pre: *n*=41; post: *n*=33) of emergency department staff performing peripheral intravenous cannulations.

This was a prospective service improvement project and, as such, research ethics approval and gaining informed consent were not required.

Results

In the pre-implementation audit (*n*=41), staff mostly used plastic procedure trays; on occasion, some used a procedure trolley surface without a tray. Both approaches involved the use of a General Aseptic Field. Failures in General Aseptic Field cleaning were generally low (*n*=3; 7.3%) but the practitioners were under observation. When re-cannulation was observed, the same General Aseptic Field was used without re-cleaning. In the post-implementation audit (*n*=33), staff opened the pack and managed the contents within the General Aseptic Field provided as part of the pack.

In the pre-implementation audit, the needle-free extension was recorded as having been collected only 68.2% (*n*=28) of the time; the most common omission observed was the under-arm drape not being used (*n*=37; 90.2%).

Figure 2. The peel-off lot traceability sticker

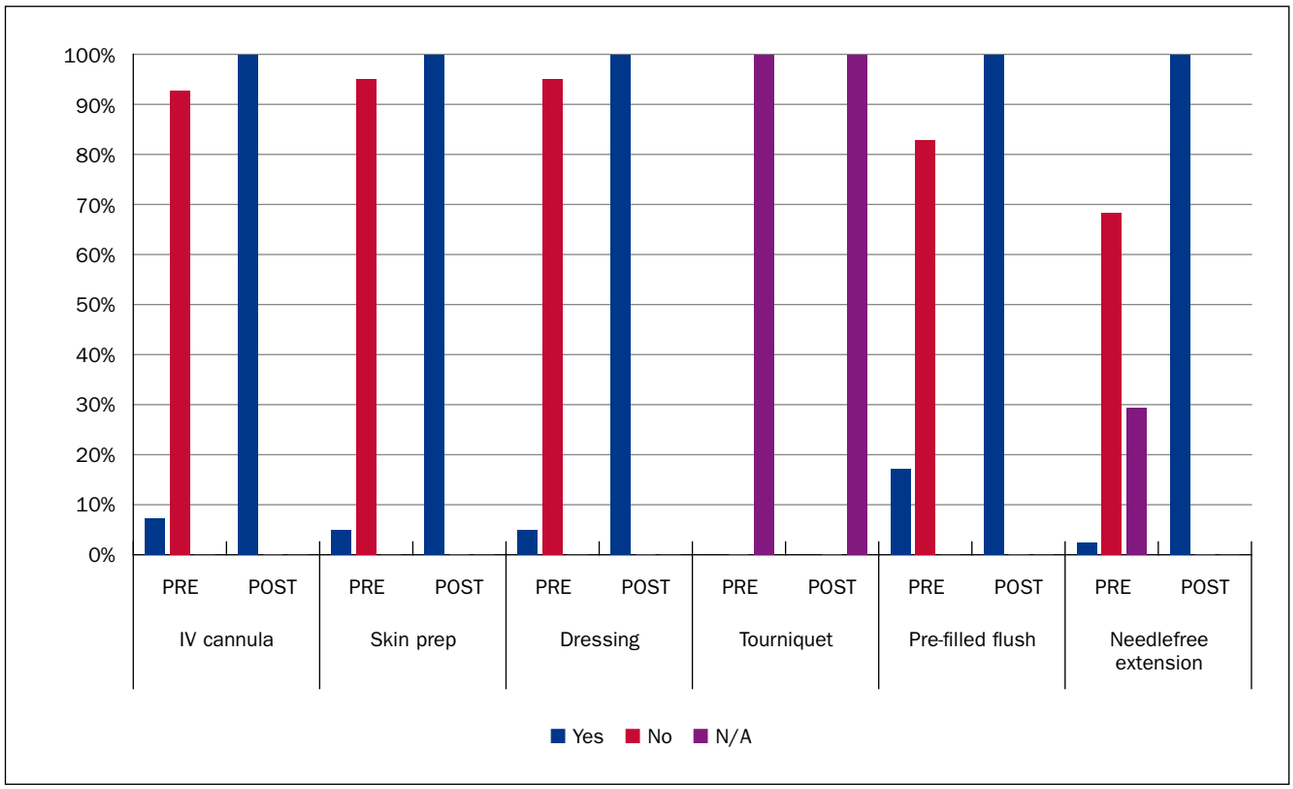

Figure 3. Equipment placed on General Aseptic Field individually protected with Micro Critical Aseptic Fields?

Key-Part protection is fundamental to safe aseptic practice, and, in the pre-implementation audit, significant Key-Part compromise was observed, with some items being removed from their packaging and placed unprotected into the General Aseptic Field (IV cannula: *n*=38; 92.6%; skin disinfectant applicator: *n*=39; 95.1%).

Although the vast majority of Key-Parts were removed from their protective packaging, some remained protected by inherent Micro Critical Aseptic Fields. For example, pre-filled syringes for flushing were used in both the pre and post periods. Pre-filled flush syringes are provided with a cap which, when left in situ, protects the Key-Part (the syringe tip) in the General Aseptic Field procedure tray. However, the pre-implementation findings highlighted the syringe Key-Part (*n*=34; 82.9%) and the needle-free extension set Key-Part (*n*=28; 68.2%) were not always properly protected. This is a significant finding, suggesting that some practitioners considered it safe to place exposed Key-Parts in a General Aseptic Field.

The Standard-ANTT cannulation procedure pack and, importantly, the education on how to perform ANTT resulted in a considerable improvement in terms of equipment being placed on the General Aseptic Field individually protected with Micro Critical Aseptic Fields. There was also greater compliance with the Key-Part of the pre-filled saline syringe being routinely protected by its sterile cap (Micro Critical Aseptic Field); moreover, compared with the pre-implementation group, the post-implementation sample achieved a 100% compliance rate for Key-Part protection within the General Aseptic Field during the cannulation procedure.

After the extension set has been primed, the Caresite Key-Part must be protected; this is most readily achieved by leaving the priming syringe connected to the Key-Part to function as a Micro Critical Aseptic Field. Following the implementation of this, protection significantly improved by more than 30 percentage points (pre: *n*=28; 68.2%; post: *n*=33; 100%).

The above results are reflected in *Figure 3*.

The introduction of the B. Braun Standard-ANTT cannulation procedure pack ensured that the appropriate skin disinfectant was selected 100% of the time. Training from the B. Braun Clinical Therapy Specialists in the handling of the pack, using Standard-ANTT resulted in: improved compliance with Key-Part protection of the skin disinfectant applicator; a reduction in the Key-Site being touched after disinfection (pre: *n*=17; 41.4%; post *n*=5; 15.1%); a best-practice cross-hatch technique being used (pre: *n*=28; 68.3%; post: *n*=31; 93.9%); and the skin being allowed to air dry more often (pre *n*=30; 73.1%; post 28; *n*=28; 84.8%).

The training that accompanied the introduction of the Standard-ANTT pack also improved compliance with non-touch technique of the insertion site (Key-Site) and the Key-Part of the IV cannula and needle-free extension set.

The needle-free extension set used both before and after the Standard-ANTT cannulation procedure pack was introduced was the Caresite positive displacement device; this should be clamped after the syringe is disconnected to allow for the automatic 0.03 ml bolus of flush solution which helps to prevent blood reflux and promote catheter patency. With the education provided from the B. Braun Clinical Therapy Specialists, the correct device clamping sequence improved significantly (pre *n*=26, 63.4%; post *n*=33, 100%).

The peel-off lot traceability sticker (*Figure 2*) provided with the packs resulted in 100% compliance with the capture of insertion data through pre-populated areas on the sticker (eg, lot number) or prompted by the sticker. In the pre-implementation group, documentation compliance was never complete; compliance previously ranged from 41.4% (*n*=17) for lot numbers to 90.2% (*n*=37;) for insertion date and site.

Consistent, appropriate compliance with hand hygiene is often reported as problematic (Erasmus et al 2010; Fuller et al, 2011; Brühwasser et al, 2016; Kingston et al, 2016). This study had mixed findings. Hand hygiene compliance before cannula insertion was more than 50% higher in the post-implementation group; however, post-procedure hand hygiene decreased by a third (12% non-compliant; 21% unobserved). These data are inconclusive.

KEY POINTS

- By protecting Key-Parts individually with Micro Critical Aseptic Fields, the clinical procedure is simplified and the management of aseptic fields is far easier; requiring less sterile personal protective equipment (PPE)
- Tailoring procedure packs to Standard-ANTT better supports best practice
- Clinical procedure packs that contain all items needed for a specific procedure can help improve aseptic technique

Discussion

The B. Braun Standard-ANTT cannulation procedure pack is a fundamental departure from traditional sterile procedure packs, which have historically dictated practice, whether a procedure requires a so-called sterile technique or not. This one-size-fits-all approach compelled healthcare workers to use and subsequently waste significant amounts of sterilised equipment when performing simple clinical procedures.

When a practitioner uses the Standard-ANTT approach to perform peripheral cannulation, they can select a procedure pack that is better tailored to this technique and supports it more ably. It is important to note that this does not mean the procedure is being performed to a lesser standard, as Standard-ANTT would invariably be used either way. Standard-ANTT packs are not used in operating theatres and are clearly marked as such.

The introduction of the cannulation procedure pack was supported by clinical education and training in ANTT, which undoubtedly would influence practice outcomes. This was further enhanced by the novel and creative approach to product instruction that B. Braun supported the packs with. This is a good reminder that any practice framework for aseptic technique is reliant on effective education and indeed other aspects of good clinical governance.

Arguably, compliance with effective procedure tray cleaning techniques in this study were unusually high compared to typical unobserved clinical practice. Given the human factors

CPD reflective questions

- Are the procedure packs you use for peripheral cannulation tailored to the type of aseptic technique you employ?
- Are you familiar with the difference between Standard-ANTT and Surgical-ANTT?
- How do you protect the Key-Parts and Key-Site when performing peripheral cannulation?

associated with busy healthcare workers cleaning and storing procedure trays to a high standard consistently, a non-sterile drape that has been produced and packaged to the high standards of a regulated manufacturing facility is likely to provide some advantage as a General Aseptic Field.

The inclusion of best practice equipment items in convenient procedure packs that are to hand has generally been accepted and adopted as advantageous. For example, having the Caresite needle-free extension included in the Standard-ANTT cannulation procedure pack means it is always available to be attached to the patient's IV cannula after insertion. This appears likely to promote a significant improvement in practice, given that a needle-free extension set was only added 63% of the time in the pre-implementation group.

Limitations

The study is a pragmatic evaluation rather than using a true pre-post methodology; a convenience sample was used and the sample groups were not matched. The sample was relatively small with no controls for heterogeneity.

Further research is warranted to examine the relationship between practice improvements and purposefully designed procedure packs that align specifically with Standard-ANTT and Surgical-ANTT.

Conclusion

The introduction of the peripheral cannulation procedure pack, tailored to practising Standard-ANTT, led to a number of practice improvements in compliance with safe aseptic technique. Given the human factors and common sense dictating that practitioners have the right equipment to hand that reflects the procedure and aseptic technique they are carrying out, it seems realistic to project that the benefits seen here could be replicated in day-to-day practice.

Subject to appropriate education and training, this study has provided a proof of concept; because of the widespread use of the *ANTT Clinical Practice Framework* as a single standard aseptic approach, procedure packs tailored to Standard-ANTT can support practitioners to deliver effective aseptic technique.

The B. Braun Standard-ANTT peripheral cannulation pack is a unique product that opens up a new paradigm for product design and clinical practice, and is already in use in many NHS hospitals. **BJN**

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